April 1964

culture

SELECTED CONTENTS

Horticulture: Of management and men . . . . . *G. D. Lockie*

And some made silage . . . . . *Stanley Richards*

The Romney Halfbred . . . . . *Hugh Finn*

Continuous Cereal Growing . . . . . *B. Wilkinson*

The Tipburn Mystery . . . . . *W. G. Hume*

Marketing Today: Veal and Eggs . *G. A. Mansfield and A. A. Eastwood*

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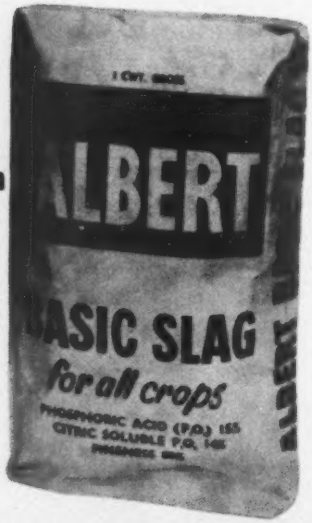
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FISONS PEST CONTROL

Agriculture

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CONTENTS

Green Gold 149
Horticulture: Of management and men *G. D. Lockie* . . . 150
And some made silage *Stanley Richards* 156
The Romney Halfbred *Hugh Finn* 159
Continuous Cereal Growing *B. Wilkinson* 162
The Tipburn Mystery *W. G. Hume* 167
Marketing Today: Veal and Eggs *G. A. Mansfield* and *A. A. Eastwood* 170
Cubicles at Auchincruive 174
Handling and Building Design *John Troon* 177
Farm Rents in 1963 181
Machinerywise—Flail Forage Harvesters
G. E. Tooby and *T. D. Dewes* 183
Ministry's Publications 185
Farming Cameo Series 3: 15. East Dorset *M. J. Bourne* . . 186
From the ALS: Choosing a Piggery *Michael F. Tilley* . . . 188
Short Guide to the Annual Review, 1964 190
In Brief 194
Book Reviews 197
Agricultural Chemicals Approval Scheme 202

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Green Gold

GRASSLAND production is no longer a difficult technical problem. Many of the answers are known: better seeds mixtures of the bred varieties, better manuring for early bite, better grazing and cutting regimes with due attention to topping; and planned rest periods. Fully integrated, these techniques are known to increase the output of grass from a given field in a given year. But how is the extra grass to be turned to profitable account?

Should more cows be kept? Should the extra grass be conserved for winter feeding, and if so, by how much would this reduce the cost of feeding concentrates? Should the ewe flock be increased and creep grazing adopted instead of set stocking? Would this produce more fat lambs or more store sheep, and which system is likely to be the more profitable? These and similar questions can be answered only on the individual farm, and then only if records are available.

More and more the adviser is being asked to resolve the economics of grassland production. He cannot do this unless records are kept and here feed recording comes into its own. Many farmers are collaborating to collect feed data in an endeavour to assess more accurately the actual contribution made by grass to total output; without it, different systems of grazing and conservation cannot be evaluated.

Feed recording is essential in planning profitable grassland production, so make a start this year. In the modern idiom, recording is a must; it could be green gold.



G. D. Lockie

Of management and men

'SEEING that a job is done'. This is a simple description of management which appeals to me. It covers what is aimed at, and it is as appropriate to commercial horticulture as it is to all forms of industry.

The methods used in seeing a job done successfully vary widely, but two things are basic: a sound objective, and determination to achieve it. These two factors approximate to the usual company arrangement—*Direction*, policy-making, and *Operation*, getting the work done. It is unfortunate that in horticulture many businesses are small, one-man concerns where these two aspects are rolled into one and frequently compete for time and thought. Inevitably one suffers; generally the emphasis is given to the practical work where the individual grower's inclinations lie.

Location and facilities

This article covers mainly the direct management functions, but it would be very shortsighted not to point out the fundamental importance of two aspects of policy in establishing or extending an enterprise. First is the choice of the best location available, particularly at the present time when Government aid to horticulture is being increased. The best location for the individual grower will often be a compromise of personal and financial considerations. Nevertheless, unsuitable climate or soil conditions limit the type of crop and place a burden on quality, quantity and cost of production. These should be seriously weighed against other considerations. In the past

choice of location involved painstaking investigation. Today the Advisory Services have comprehensive information on many areas of good potential from which a choice to suit personal requirements should be made much easier.

The second fundamental is to have the right facilities. Again, these are affected by location, financial resources, market opportunities and labour supply. Many questions can only be decided by the grower himself after consideration of all the information available. Examples are what is the most remunerative orchard to plant, whether extensive or intensive, choice of varieties; whether to build the cheapest glasshouse or best designed and equipped; and so on. Often there is no clear-cut answer. So much depends on the wisdom of the grower.

Operation of the enterprise

'Seeing the job is done' includes growing the plants, buying materials, marketing and a dash of all trades. It is therefore convenient to divide the subject into different functions. These vary in importance with the size and complexity of the business, and they range from essential to desirable. Success depends largely on the ability of the man who leads an organization; we are not concerned with the exceptional man who runs everything successfully from his own head and the back of an envelope, but with the normal manager who will succeed better by planning, analysing, improving and maintaining his programme. The important management functions are:

Planning: This really means thinking ahead, making use of the records kept of past experience.

With the help of these we can decide on:

Cropping programmes: what we are going to grow, why, how, and who will carry out the work?

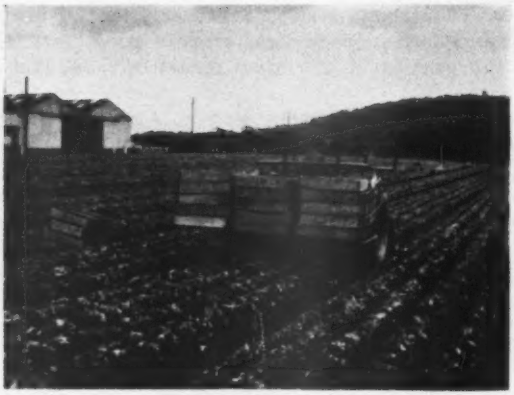
We can also work out a

Financial budget: what is our expenditure going to be, what turnover can we forecast, will the gross margin be sufficient to cover overheads plus the return on the investment?

These plans are the basis for the period ahead. In a simple business they may be all that is needed. Generally, the following up-to-date records are very desirable: (1) Crop production and sales value; (2) Labour used in time and money; and (3) Expenditure on materials, fuel, plants or services posted when committed in a simple cumulative account for the whole or part of the enterprise.

Time-sheets filled in daily to crops or any unit are a practical and old-established basis for recording labour. Such records, maintained weekly or monthly, can be compared with those of previous years and against the budget estimates, so bringing to the fore unusual deviations for reconsideration in making future plans.

The gross margin or profit, left by deducting from the income received the direct costs of labour and materials including fuel and marketing costs, is generally a very satisfactory guide to cropping results for management purposes. Complete costing must be considered against its practical usefulness and cost. A detailed analysis of expenditure to show up items where savings



Boxes are taken out by a tractor with crop carrier and put in readiness for cutting lettuce

might be profitable and the determination of an overhead cost which can be apportioned to individual items giving a full cost becomes more desirable in complex enterprises with many crops and sections.

Four points in organization

In talking generally of horticultural management we have first to remember the one-man or family unit. The different aspects of management must be achieved by the individual dividing his time or obtained as a service such as exists in the Land Settlement Association. Four main aspects are: direct crop management and marketing; accounts and secretarial work; labour use and work study; and technical development.

If the organization is big enough these activities can be given to individuals. Clearly there are so many possibilities that one can only recommend careful consideration of how these requirements are to be met. I would particularly emphasize that too little effort is applied to the best use of labour. Labour generally costs growers a third or more of the turnover, but is seldom given anything like a third of management's time and consideration. Three aspects of labour require constant attention.

Knowledge and skill

With a few notable exceptions, commercial horticulture has failed to have any plan in its labour force. The most knowledgeable workers have become charge-hands, charge-hands become foremen, and foremen are promoted to managers. The general worker has gone on in his job with no differentiation between the highly skilled and the just adequate. Such a situation is unsatisfactory in present times. Better technical ability is needed for modern methods of cultivation. We must be able to keep skilled workers despite competition from other industries. One of the solutions is a grading of workers with commensurate benefits, both in work performed and remuneration for skill.

Good methods

Full and proper use of labour are very important to all sizes of enterprise. In the one-man unit they are essential, if only to allow time for other jobs or

relaxation. The ways of achieving better methods and performance may vary from deliberately stopping to ask why are we doing this job, or whether it can be done a better way, to seeking assistance from another experienced grower or, in the larger concern, to employing a suitably skilled man.

At Fernhurst, starting a horticultural enterprise requiring new staff and workers showed the need for a more positive approach to the use of labour. The techniques of work study appealed to us, both as a tool in finding out more about our operations and individual jobs and as a means of paying fair incentives. When our total wage bill had reached £15,000 we considered that employing a full-time work study officer would be a good investment. Over a period of ten years this has been amply proved and we have co-ordinated the work with labour management to provide data for everyday manning of jobs and planning.

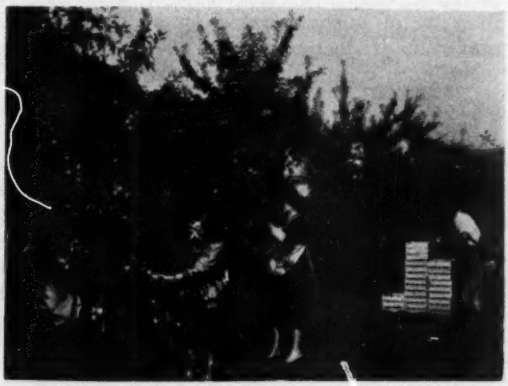
Direction of effort

Because seasonal weather differences have such an influence on crop timing and working conditions, pre-planning can only anticipate average cultivation and marketing times. The management has to be constantly alert and ready to make adjustments. Early seasons throw forward peaks of work, and vice versa. It is essential in horticulture that these requirements can be met. Delayed operations can mean substantial losses in quantity and quality of crop. A good example of this is chrysanthemum disbudding, where too late removal of lateral buds can reduce the grade of flowers and boxes packed per unit area of production by 25 per cent or more. Again, delayed de-shooting and training of tomatoes will reduce yield by 10–15 per cent, in addition to increasing the labour and costs of catching up with the work.

Co-ordinating effort and creating harmony

Few enterprises are free from occasional discord. Sometimes over- or under-zealous work raises difficulties. Differing facilities upset workers doing the same type of work, and adverse conditions throw up troubles.

In the small concern these are generally overcome by the close relationship between management and men. In larger concerns, particularly where different departments may be relatively remote, deliberate planning to



Picking Cox's Orange Pippins at Fernhurst. Three pickers clear the lower branches first. Two more follow on medium ladders, and finally one picker on a high ladder collects the apples from the top of the tree



This single-span, east-west glasshouse is ready for planting with tomatoes. The heating pipes can be seen close to the ground

encourage communication of policy, plans, new working schemes and such important subjects as safety regulations is most valuable. At Fernhurst we have operated for years an Estate Council which includes an equal number of democratically elected workers and management representatives. This has done much to promote exchanges of ideas and resolve difficulties. Evidence of workers' interest is shown by the balance of agenda items being equally distributed.

The manager himself

The last function of management is particularly associated with the larger enterprises. Where the manager has to exercise an overall control, all the functions discussed can be playing their part in a mechanical way without achieving success. Most enterprises need characters to give them enthusiasm, sense of purpose and determination to see that the job is done.

Before leaving the functions of management proper emphasis must be given to technical developments. Every grower or his manager must maintain a progressive attitude, selecting, testing, discarding and developing new methods, techniques and material according to his crops. Such is the intensity of horticultural cropping that cost will only be kept down if maximum production of good quality produce is preserved. Labour requirements must constantly be minimized by the best methods at our disposal.

Management at Fernhurst

It is difficult to demonstrate such a complicated subject as horticultural management by comparing before and after results, and it is seldom possible to take two like enterprises for treatment by different types of management. The many variables in season, proportion of different crops and markets make comparisons difficult. Each enterprise has to be judged on its merits. Unless great care is taken in assuring reasonable similarity of accounting, comparisons of cost outside one management unit can be most misleading. As an indication of our experience at Fernhurst we can show the relationship of expenditure and income over the last ten-year period for a horticultural

enterprise of 120 acres established in 1946. This comprises 50 acres market garden, 1 acre Dutch lights, 2·5 acres glasshouses and 66·5 fruit.

During the period only one production unit, a glasshouse 150 ft by 45 ft, was added (in 1955). The market garden grows only outside crops, the variety is limited because of heavy soil. Glasshouses, Dutch lights and orchard crops were selected to be typical of the important U.K. varieties, and the orchards had just reached the stage of income covering expenditure in 1953.

Gross value averaged for all crops per acre was £423 in 1953, rising to £940 in 1963—an increase of 122 per cent in ten years or 12 per cent per annum. Expenditure during the period was £363 in 1953, rising to £783 in 1963, an increase of 111 per cent in ten years or 11 per cent per annum. The margin per acre increased from £60 in 1953 to £156 in 1963—151 per cent in ten years or 15 per cent per annum.

This increase in profit per acre is due to improved production, while costs were controlled.

Higher production

Improved production has resulted from the fulfilment of planning technical developments and rationalizing of crops. Orchard production has increased with the growth of the trees. In the glasshouses cropping has been intensified and crops obtained earlier. The use of records and costing has enabled us to select the most profitable. Strawberry production has been developed on the market garden, replacing brassicas. Crop wastage has been kept to a minimum by spray programmes controlling diseases, particularly strawberry botrytis and gloeosporium storage rots of apples. Yields of market garden and soft fruit crops have been increased by controlling weeds economically with chemicals before these affect the crop. As examples Diquat and Paraquat are used as routine sprays before crop emergence and as inter-row sprays using dribble-bar hand and tractor-mounted applicators.

Costs held

Crop costs have been controlled by better culture, better methods and techniques. These materially reduce pre-harvest costs and increase production. Statutory and merit increases of wages are offset by more efficient methods and higher output. Work measurement and incentives lead to more economical output. During the period the combined wages and salary expenditure has been kept to the same level, while statutory increases in wages amounting to 52 per cent have had to be paid.

Chemical weed-killers have replaced manual labour and mechanical cultivation in crops, with a saving in cost and increased production.

Better overall use of labour has resulted from reducing the winter crops on the market garden and transferring the workers to harvesting and pruning in the orchards. During the summer the orchards staff help with peak harvesting and planting on the market garden.

G. D. Lockie, N.D.H., is Estate Manager at the Fernhurst Research Station of Plant Protection Ltd. He was trained at the John Innes Research Institute and was Manager for F. A. Secrett at Bell Farm, Walton-on-Thames, before joining Plant Protection when the Fernhurst estate was purchased in 1945.



Stanley Richards

who makes over 300 tons of silage on his 208-acre farm in Carmarthenshire

And some made silage

LIVING in a county like Carmarthenshire which enjoys (or suffers!) an annual rainfall of some 55 inches, and where grass conservation in the form of hay and silage is in the order of 100,000 acres, it is fair to say that tradition dies hard and haymaking is still the usual practice. The same is probably true in varying degree for most parts of the country—but why?

There are probably two main reasons. One, the bitter memories of futile attempts at salvaging hay in the form of 'silage' during inclement weather. Second, the suspicion that there is something terribly difficult and mysterious about the art of making good silage—which, of course, is quite untrue.

Silage-making is well within the scope of most farmers large or small, provided one has the right sort of equipment. For the small man, a mower, a buckrake and a covered silo may do. The larger farmer wants a forage harvester and tipping trailers. But for each the cost will be far less than that for the usual haymaking equipment.

Naturally, good quality grass must be grown, because the finished product can never be better than the material that goes into the silo.

D-day by the calendar

The time of starting operations is of paramount importance. After years of silage-making I am convinced that one should start, within a few days, by the calendar (whether the season be early or late); otherwise Nature and

the month of June will inevitably catch up with you. I usually aim at starting cutting on 10–15 May. I like to give each field a grazing first—if only a light one—before taking a silage cut. I ensile in the same rotation as the grazing and prefer taking one medium cut off a larger acreage to two cuts from a smaller one. Perhaps two grazings might be taken from the last two fields intended for cutting—which helps the sward; indeed, after two grazings the field would need to be topped anyway.

For top quality silage, both scientist and adviser often stress the importance of ensiling the crop before it runs to head. But in practice, when making a fair quantity, unless you burden yourself with a plethora of equipment and labour, it is extremely difficult, if not impossible, to do this. Most grasses run to head within a few days of a given date, regardless of season. Some comfort, however, may be derived from the fact that a little of the more fibrous material has a balancing effect on the cow's diet, obviating the necessity of offering any hay—or at least very little.

If it is at all possible to avoid having capital tied up in both haymaking and silage-making machinery, then do so. A small acreage of hay might well be made by contract.

Wilting grass for silage is a development that slightly disturbs my conscience, for having listened to eminently practical men speak of its added nutritional value, I dread to think of turning what is at present a very simple method of silage-making into a more complicated one. But as I write this article, I am wondering how long it will be before I shall bow to the inevitable and wilt. One envies the small acreage man with the buckrake who wilts anyway.

Getting it made

The great advantage of silage-making is that if the weather is difficult you can make good silage. If the weather is good you can make excellent silage! While it is unwise to start ensiling before the dew rises, you should not lose sight of the main objective—to make a lot of good silage in as short a time as possible with the minimum of labour and machinery. A tall order—maybe—but it is surprising how a little attention to the finer points can help to speed up operations.

Choosing the right forage harvester to suit your tractor is, of course, most important. Quite by accident I found that a particular make of machine could be taken at a higher gear on the same field and crop than another, which gave us a saving of four minutes per load. An adaptation on the trailer tailboard to allow quick release, tipping the load on the sweep to avoid the tricky business of reversing both harvester and trailer, widening difficult gateways, filling in the odd pot-hole—all these points (and many more) may not seem much in isolation, but added together they can easily mean an extra six to seven loads a day.

The customary three days wait after the initial filling for the temperature to build up is unnecessary with the larger silos. I make over 300 tons of silage a year and usually start off in three separate blocks, going back to the first one on the fourth day. Some people get away without spreading the buckrake loads on the silo, but if the labour is available I am sure it is worth doing. I also make a point of keeping the top of the silage saucershaped, but don't roll excessively by tractor.

The walls of my silo barn are made of reinforced concrete blocks. At one time I used to have never less than six inches of waste on the sides. I then decided to render the walls with a cement coating, and the result was most pleasing—not a scrap of waste.

After being persuaded that ground limestone was good material to use for sealing down, I covered one-half of the silo as an experiment. The result was two inches of waste on both halves and a lot of dirty sticky muck to remove—not to mention the bad language—so never again! When available, I now use fresh green grass to finish off the silo.

How much?

How much silage to make is the problem that puzzles most farmers, especially those on self-feeding. Despite shortening of the winter at both ends by the improvement in grasses, greater use of fertilizers, etc., it can seldom be depended on to be less than enough for four months in my part of the country. With twenty-four hours access and *ad lib.* feeding, I need at least 5 tons per cow. There are good methods today for controlling the face, and they do tend to lower the intake without, I think, materially affecting the output of milk.

In a season of plenty it is a temptation to pile the silage to excessive heights. Once it nearly cost me the complete collapse of the silo! Fortunately, three tie rods between the tops of the stanchions saved the situation.

I always like to have an analysis of the silage in early winter. It can be a valuable guide to the capacity of the material to save concentrates—and that is the real measure of one's success or otherwise.

Silage-making may seem difficult to the beginner, but what isn't? Once started, there are no problems that the ordinary farmer cannot overcome.

Mr. Stanley Richards, the author of this article, was Chairman of the Carmarthenshire Branch of the National Farmers Union for four years and is at present Chairman of the Carmarthenshire County Agricultural Executive Committee. His 208-acre farm at Kidwelly carries 60 Friesian milkers and followers and 90 Welsh Halfbred ewes. He has 40 acres under barley, which is fed to supplement the silage, and also 16 to 20 acres of kale.

THE ROMNEY HALFBRED SHEEP BREEDERS' ASSOCIATION has the following aims:

To produce a halfbred ewe which will excel as a producer of fat lamb; one which will thrive under most conditions, having a high rate of prolificacy and producing a good fleece of wool, strong characteristics for longevity and resistance to disease



The Romney Halfbred

North Country Cheviot* x *Romney Marsh

Hugh Finn

I think it is fair to say that little constructive breeding on modern lines has hitherto been practised in the sheep world, but there is a growing realization among sheep men of the immense possibilities and opportunities for anyone who is prepared to apply modern scientific breeding methods to sheep. These methods have paid off handsomely in poultry breeding and, to keep abreast of current developments, and produce sheep which meet modern requirements, it will be necessary for sheep breeders to collaborate and take advantage of present-day scientific knowledge.

I do not necessarily subscribe to the view that we have too many breeds of sheep in this country, but I am, nevertheless, convinced that only those breeds which can satisfy popular demand can hope to survive. A limited number of breeds may retain their self-sufficiency as pure breeds, but a vital condition for the survival of most British breeds will undoubtedly be their ability to cross successfully with other breeds and produce a halfbred capable, by hybrid vigour or heterosis, of fulfilling these demands.

Kent or Romney Marsh sheep are doing well commercially all over the world, but in competition with other breeds at home they do not always compare so well as a pure breed. When crossed with a North Country Cheviot ram, however, we have found over the past two years that at least two important factors show considerable improvement—prolificacy and fat lamb potential.

The Halfbred ewe from this cross (the Romney Halfbred) is an active, whitefaced sheep, very hardy, an excellent milker, with a record for good teeth and long life, losing little or nothing in wool as compared with her dam and, when crossed with a suitable Down ram will produce a first-class fat lamb. A lambing percentage of 150 per cent or more can confidently be expected under good management.

The Association and a breeding plan

With these facts in mind, some thirty sheep breeders in Kent decided to get together and form an Association, the aim being to produce a uniform type of halfbred ewe suitable for most British conditions and to work in close collaboration with our colleagues in Caithness who breed the North Country Cheviot rams. Future plans include further collaboration with Caithness Livestock Breeders, who propose instigating an improvement programme and progeny testing scheme. We shall then have the opportunity of securing even better North Country Cheviot rams to sire our Romney Halfbreds. Hand in hand with the Caithness programme will go progressive improvement of pure Kent or Romney Marsh ewes. Recording and progeny testing has been practised for some time in some Kent flocks, and these flocks in turn will make progeny-tested rams available to owners of pure Kent flocks to multiply improved Kent ewes needed by Romney Halfbred producers.

The final task of the Association will be to find the most suitable Down ram to cross with the Romney Halfbred to produce the fat lamb we are all looking for.

This therefore creates a five-tier breeding plan:

1. The breeding of recorded, progeny-tested, Kent and North Country Cheviot rams.
2. The Pure Kent ewe breeder, using Kent rams from stage 1.
3. The Romney Halfbred producer, using ewes from stage 2 and N.C.C. rams.
4. The Down ram breeder for crossing with R.H.Bs.
5. The fat lamb producer, using R.H.Bs. and rams from stage 4.

Here then is an illustration of collaboration between sheep men to combine the best factors of native breeds by crossing and making use of hybrid vigour to produce a commercial breeding ewe capable of producing uniform



North Country Cheviot ram and Kent ewe



Romney Halfbred ewes on Mr. W. H. Mouland's farm at Lower Halstow, nr. Sittingbourne

fat lambs best suited to modern needs. At the present time we are dealing with the middle tier, and it is anticipated that the organization of the other tiers shall grow out of this.

Then marketing

All this immediately suggests some form of organized marketing and a regular supply of uniform carcasses over an extended season. To this end, this Association proposes to work closely with S.E. Quality Meat Producers Ltd., when supplies and circumstances permit. It is estimated that upwards of 5,000 Kent ewes have been mated to N.C.C. rams this season under Association rules. The objective is 10,000 next season, rising to 20,000 in two years, with the possibility of anything up to 100,000 in five years.

Kent ewes for crossing with North Country Cheviot rams will be inspected and approved as suitable, and all rams will be bought through the Association, having previously been approved by Caithness Livestock Breeders. Collective sales of Romney Halfbred females will be arranged under strict control. All sheep offered at these sales will be inspected, approved and sold under the Association's 'Clover Leaf' trade mark.

We cannot afford to rest on our laurels in a fast changing world; and whilst a figure of 150 per cent prolificacy has been mentioned, we must strive for a much higher figure. Success will obviously depend on the manner in which the Association and those who work with it are organized, and above all how closely and energetically all involved will collaborate.

As well as being Chairman of the Romney Halfbred Sheep Breeders Ltd., **Mr. Hugh Finn** is a Director of several other farming companies. He is also Chairman of the Kent County Agricultural Executive Committee and is a Governor of Wye College. His family have been concerned in the breeding of Kent sheep on the Romney Marsh since 1750. He himself is interested in a family farm of 600 acres at Nackington, Canterbury, and also does some farming elsewhere.

How does the soil stand up to continuous cropping under cereals for a long period—five years or more?

This question, often asked, is answered by the N.A.A.S. Soil Chemist, S.E. Region

B. Wilkinson



Continuous Cereal Growing

Pallas barley

To sustain economic crop production, a soil must satisfy three basic requirements: it must provide a satisfactory environment for establishment and plant root development, provide an adequate, balanced supply of plant nutrients and water, and it must be free from pests, diseases and weed competition. In this article the first and second requirements only will be considered.

The first requirement is obviously concerned with the physical condition of the soil, which must be adequate to permit germination, establishment and the maximum development of the cereal plant. For continuous cereal growing, two physical properties exert a major influence on crop growth—soil structure and soil drainage. But first let us look at soil organic matter.

Organic matter

Where the organic matter in the soil is initially high (greater than 10 per cent), then decomposition losses can be high when the soil becomes warm, moist and aerated by cultivations. Losses of the order of 40 tons per acre

per year and 5–10 tons per acre per year for a fen and grassland soil respectively have been estimated. As the organic matter levels are lowered through the decomposition processes, there is a parallel reduction in the rate of loss of organic matter. Eventually an equilibrium level is attained, probably in the range 2–4 per cent, according to soil, climate, the organic additions such as stubble and straw, and the decomposition processes.

Estimates of the organic matter returns in cereal stubbles have been attempted and the following table shows the order of magnitude of these residues.

Residues after cereal harvest	*Cereal stubble*	*Cereal stubble + undersown ryegrass*	*Cereal stubble + undersown red clover*	*FYM 10 ton*
Organic matter (*lb/acre*)	1,900	3,470	3,800	4,220
Nitrogen (*lb/acre*)	24	44	93	110
%N in organic matter	1·3	1·3	3·0	2·2

(Ref. SMITH, A. M. and MABBIT, L. A. (1953) *J. Soil Sci.* 4, 98)

If the straw were also available, an additional 1–1½ ton/acre organic matter could be returned. Ploughed-in weeds would be an additional contribution.

Two other agencies, however, can further reduce the levels of soil organic matter: (1) deep ploughing, by diluting the organic matter throughout a larger volume of soil and (2) erosion. Wind erosion can be troublesome on certain very light soils and organic soils, particularly in a dry spring and the early summer months, and sheet erosion, through the washing of soil down slopes, does occur locally in certain fields.

Soil structure

Several factors contribute to the formation of soil structural elements—mechanical composition, organic matter, iron compounds, calcium carbonate, root activity, biological activity, weather and cultural treatments. The structure which results differs in nature and stability for different soils, situations and treatments. In one soil the main factor influencing stability may be the mechanical composition, whilst in others organic matter or iron compounds or calcium carbonate may be dominant.

Problems arising from breakdown of soil structure are common in soils with a high proportion of fine sand and silt in them. These particular soils are stable when organic matter levels are high, but the surface structure becomes increasingly unstable as the organic matter decreases. During the process, the fine particles in the soils tend to flow when wet, causing settlement in compact layers or the formation of a hard crust. If the instability is severe, then the organic matter must be increased. In such circumstances continuous cereal growing could run into difficulty.

On other soils where structural stability is primarily a function of the cementing action of iron compounds, clays or calcium carbonate, the influence of organic matter is proportionately reduced. Under these circumstances, low organic matter has a marginal effect, so that continuous cereals raise no serious structural difficulties. This situation has been well demonstrated on certain soils on chalky boulder clay, chalk and associated deposits, sands and marine alluvial deposits.

In practice, farmers growing cereals continuously do find some deterioration in physical conditions. It varies with the soil. Their soil management must therefore be of a high standard. A cultivations programme must be adhered to strictly, for there is less flexibility in coping with abnormal seasons. For example, on a heavy land farm on the Chilterns, a farmer who adopted a continuous cereal system more than twenty years ago has found that he must complete his ploughing and winter drilling programme by November, otherwise soil conditions are quite impossible. His whole system could be thrown out of gear. Normally, the programme is achieved and, with his high overall management, consistent economic yields are maintained.

Soil drainage

We must also consider two aspects of drainage—ground water and surface water. The former is a function of topography and geology. Provided therefore the drainage system, natural or artificial, can cope with the ground water on the site, continuous cereal growing will not influence the position. Surface water drainage, on the other hand, is influenced by structural conditions in the surface horizons of the soil. Any inclination towards structural instability could manifest itself in the development of a surface crust or pan, which creates cultivation difficulties by reducing permeability to water or exaggerating erosion problems. Appropriate measures must be taken to overcome difficulties as they arise on individual soils, and in the majority of cases the problem can be solved satisfactorily.

Nitrogen

Nitrogen reserves are directly related to soil organic matter levels. Consequently, as the organic matter decreases the soil nitrogen reserves contribute less to the nutrition of the crop and higher fertilizer nitrogen must be applied if economic yields are to be maintained. Where, under a continuous cereal system, fertilizer nitrogen is omitted, striking nitrogen deficiency symptoms are seen in the crop, particularly in spring and early summer. Dressings rising to 100 units of N may be called for. Besides the actual rate of application, the influence of such factors as the time of application and the efficacy of the different forms of nitrogen fertilizers on the various soils, particularly for winter cereals, are correspondingly critical. Fertilizer practice, with emphasis on nitrogen, must achieve a high standard.

Phosphorus and potassium

The soil phosphorus and potassium status is governed by inherent soil properties plus fertilizer and crop residues, how much nutrient is removed by the crops, and the effect of changes in soil physical conditions.

If the initial phosphorus status of the soil is low, then three to five years of liberal dressings will be necessary before satisfactory levels are attained, and the combine drilling of fertilizer phosphorus will be well worth while. Following this build-up period, the fertilizer and soil residues are usually effective for a prolonged period. Maintenance dressings are then sufficient for crop production, and flexibility in the fertilizer programme is permissible. Most of our experimental evidence indicates that the phosphorus requirement of cereals is relatively low.

Soil parent material has a dominant influence on the potassium status. Minerals, of both primary and secondary origin, in the soil control the natural potassium status and the rate of potassium release. The higher the clay content, the greater the potassium-supplying power; conversely, soils with high sand fractions are almost always poor releasers. Soils with low potassium levels can be improved relatively easily by applying fertilizer, but similarly the residues can be depleted quickly. However, fertilizer residues, from dressings applied over the last twenty years, have improved the overall status of most soils in the cereal growing areas.

As stated earlier, it is of paramount importance to satisfy the nitrogen requirement if economic yields are to be maintained. Normal fertilizer applications for cereals would be recommended in the form of compound fertilizers of ratios approximating to the 2 : 1 : 1 type.

Examples for Two Compound Fertilizers

Rate/acre applied	*Nutrients applied (units)*						
Fertilizer (a) Composition	20% *N*	10% P_2O_5	10% K_2O	*(b)*	21% *N*	14% P_2O_5	14% K_2O
3	60 N	30 P_2O_5	30 K_2O		63 N	42 P_2O_5	42 K_2O
4	80 N	40 P_2O_5	40 K_2O		84 N	56 P_2O_5	56 K_2O
5*	100 N	50 P_2O_5	50 K_2O		105 N	70 P_2O_5	70 K_2O

*Normally not combine drilled

These practical recommendations can therefore adequately compensate for nutrient removals whilst still catering for the needs of the growing crop. Flexibility within the fertilizer programme, in respect of phosphorus and potassium, is permissible to allow adjustments for the application of straight fertilizers at infrequent intervals, if this is likely to help farm organization.

Adverse effect of bad soil structure on fertilizers

Poor physical soil conditions cause root restriction and reduce the available soil moisture. And this in turn means less nutrients absorbed. Coarse tilths allow the soil to dry out under the influence of spring winds, which again reduces nutrient availability and may retard or reduce the germination of the grain because of the localized high salt concentrations.

Combine drilling of fertilizers should be advantageous on soils where physical conditions have deteriorated or which have a tendency to drought in the summer. This applies mainly to the heavier and lighter types of soil. On medium textured soils the advantages of combine drilling of fertilizers over broadcast application are, on average, much reduced, compared with conditions twenty years ago.

Soil management is the answer

Although soil problems do arise with continuous cereal growing, they are in most instances likely to be smaller than those associated with pests, diseases and weeds. On certain difficult soils, low organic matter might result in serious structural problems, but in these cases continuous cereal growing would be abandoned or a specific remedy introduced, which would, however, add to production costs.

On the majority of soils where continuous cereal growing is practised, soil physical conditions do not create serious problems *under normal conditions*. Structural stability does deteriorate to varying degrees, but a high standard of soil management can offset any adverse effects. But it must always be realized that the cereal grower has less flexibility with his soil, compared with the position in rotational farming, in combating the effects of abnormal seasons. Consequently he has to adhere to a strict cultivations programme. Good cultivations, appropriate to the soil, not only regulate the soil physical requirements, but also help to control diseases, pests and weeds.

On the plant nutrient side, high rates of fertilizer nitrogen are indispensable, and careful attention must be paid to all aspects of fertilizer practice in order to achieve maximum economic yields. Sound fertilizer practice can, in addition, contribute to reducing the extent of disease, pest and weed problems. Within this framework a certain flexibility in the time of applying phosphorus and potassium is permissible, although maintenance requirements of these nutrients can normally be satisfied by applying an appropriate compound fertilizer.

Next month Dr. H. E. Croxall, Plant Pathologist for the W. Midlands region of the N.A.A.S., will discuss the disease hazards of continuous corn growing.

FOR YOUR DIARY

The major shows this year:

			Theme
Bath and West	June 3–6	Swindon	Meat for the Million
Three Counties	June 16–18	Malvern	(*No central theme*)
Royal Counties	June 24–27	Poole	Effluent Disposal
Royal	July 7–10	Kenilworth	£ *s. d.*
Gt. Yorkshire	July 14–16	Harrogate	Modern Sheep Management
Royal Welsh	July 21–23	Builth Wells	Quality Fodder for Economic Feeding



Marginal leaf scorch on edges of outer leaves

Tipburn and marginal leaf scorch usually become apparent when lettuce is approaching maturity, and these faults naturally reduce their attractiveness on the market and the price they realize. In severe cases many lettuce heads are unmarketable. These disorders, then, assume national importance, and as such appear to merit priority in a research programme

The Tipburn Mystery

W. G. Hume

The disorder commonly known as Tipburn is general wherever lettuce is grown. The descriptions of the symptoms vary enormously in different parts of the world, and the suggestions put forward as possible causes of it are equally varied, covering the interactions of all cultural aspects and environment. Indeed, in Britain alone opinions differ as to the symptoms which constitute Tipburn, and, even between counties, it doesn't always mean the same thing. It is not surprising, therefore, that Tipburn has not been the subject of any intensive research or experimental programme.

The confusion is increased by other physiological disorders, some of which give rise to small water-soaked spots on the leaf edges, which later turn brown, or by rot-producing organisms which cause watery tissue breakdown.

Symptoms of Tipburn

The several forms of what is generally known as Tipburn, range from a brown discoloration on the leaf margins of older leaves, producing a marginal leaf scorch, to browning of leaf edges on the leaves directly covering the heart of the lettuce. In some cases internal browning occurs which may be associated with external symptoms, or it may be visible only when the lettuce is cut open. Internal browning may give rise to a progressive



Here Tipburn has affected the heart leaves and caused internal browning

internal breakdown and so end as a soft rot, often referred to as 'greasiness', and which may not always be associated with Tipburn.

Other factors affecting cultural conditions can produce marginal leaf scorch symptoms. The characteristic yellowing and browning of the leaf margins sometimes seen on lettuce grown on soils very low in potash is not infrequently mistaken for Tipburn. The condition is more usual on crops grown in open land, and is rare in glasshouses where potash is generally at an adequate level.

Under glass, however, manganese toxicity, induced when some soils are steam sterilized and accentuated by soil acidity and a low phosphate status, produces symptoms of marginal leaf scorch very similar to Tipburn.

What are the responsible factors?

There are many factors which could be responsible for Tipburn and marginal leaf scorch, and diagnosis of the disorder is complicated by the diverse methods of growing lettuce, both under glass and in the open. It is thought that the disorders are influenced by all factors that affect absorption of water and transpiration from the leaves. Thus plants are liable to attack in periods of high air temperature, when soil temperatures are low, or when there is low atmospheric humidity. Fertilizer unbalance, especially very high nitrogen giving vigorous growth, can be a contributory factor. The trouble may be aggravated also by poor soil structure, an acid soil, a very dry soil, or one with a high salt concentration.

No fully resistant varieties are known and any information we have is based purely on observations. It appears, nevertheless, that varietal differences do exist. Dutch experience suggests that May Queen and Northern Queen tend to be susceptible, while varieties like Early French Frame and Blackpool appear to be a little more resistant. Reports from elsewhere indicate that lettuces of the 5B type suffer less from Tipburn and marginal leaf scorch, but many growers in this country would not agree.

The necessity for examining varieties with a view to the possibility of finding a linked character which would facilitate breeding for resistance is clearly indicated.

Search and a survey

All these difficulties were encountered in trying to establish a standard diagnosis of Tipburn from experimental work with lettuce at the Ministry's Experimental Horticulture Stations. As a result, N.A.A.S. officers have been

in close consultation with the Glasshouse Crops Research Institute and the National Vegetable Research Station. Primarily it was important that the extremes should be defined, so that distinct features could be recognized and identified as coming within one of two categories.

Where marginal browning is predominantly on, but not confined to the wrapper leaves of the lettuce heart, the symptom should be known as Tipburn. This may be associated with internal browning, but all plants within a crop are not necessarily affected. As distinct from this, marginal leaf scorch should be defined as a marginal browning occurring largely on the expanded or outer leaves with little, if any, discoloration on the heart leaves.

It was thought that there were too many interacting factors to form a basis for any immediate investigation, and it was decided to carry out a survey to get as much information as possible. To this end, N.A.A.S. Horticultural Advisers, in the course of their advisory work and when visiting nurseries where these disorders are occurring, have been asked to complete questionnaires. The results, when analysed on a national basis, may bring to light some common factors which could allow a reassessment of the problem over a narrower field, and provide a more definite basis for a programme of research and experimental work.

Can anything be done now?

You will ask, however, whether *any* control measures against these disorders are possible. Where lettuce is grown on a field scale the crop is subject to variations of temperature and rainfall. Under these conditions very little can be done, apart from ensuring that the soil is in a sufficiently good state of fertility and is adequately supplied with moisture so that steady growth is maintained up to harvest.

A greater control of environment is possible under glass, and the grower of glasshouse lettuce is in a better position to take steps to improve those conditions which it is thought are responsible for Tipburn and marginal leaf scorch. He can flood the soil sufficiently before planting, and during the winter can thus obviate the necessity for further heavy waterings, which tend to lower soil temperature. He can ensure good drainage and soil structure by adding sufficient organic matter, he can control atmospheric humidity, and he is a position to give shading when necessary shortly before crop maturity. Finally, he can regulate temperature according to outside weather conditions and encourage the development of sturdy plants by good ventilation as and when required.

Until the causes of these physiological disorders are known, however, Tipburn and marginal leaf scorch of lettuce are likely to occur, even when meticulous care is given to the cultivation of the crop. It is hoped that the survey which is being carried out will lead to a greater understanding of this problem and thus enable investigational work to proceed.

W. G. Hume, N.D.H., is Horticultural Adviser on Glasshouse Crops and Vegetables in the West Midlands region of the National Agricultural Advisory Service, which he joined in 1946. Before taking up his present post he was County Horticultural Officer for Worcestershire for eight years. He acted as convenor of the working party dealing with Tipburn of lettuce, which is mentioned in this article.

Veal and Eggs

Farmers combine for producer marketing

VEAL IN DORSET AND HANTS

In April, 1962, twenty-five farmers producing veal formed themselves, with the help of a local firm of wholesale butchers, into the Wessex Quality Veal Producers' Group. The butchers concerned, Bellinger Bros. Ltd., were at that time buying veal from over 140 producers within a 50-mile radius of their slaughterhouse at Dorchester, Dorset. To begin with, a level delivery qualification was suggested for membership of the group, in addition to which at least two-thirds of a producer's carcasses had to qualify for the quality grade. In practice, only the quality requirement has been enforced.

By August of the same year the group had decided to turn their attention to marketing. Most members at that time had satisfactory sources for obtaining suitable calves at a reasonable price; they were also relatively happy that they had sufficient control over their costs of production. The group itself fostered the interchange of technical and management information. This meant that the only facet of their business outside the producers' control was the profitable disposal of the finished product.

The slump in veal prices on Smithfield during October and November, 1962, brought about by the sudden inrush of veal from Holland, when the French and Italian markets were temporarily closed to the Dutch producers, brought the problem to a head. Prices dropped to below cost of production, and no support payments are available for animals slaughtered at veal weight.

A three-stage marketing scheme was therefore devised with the intention of not only stabilizing prices but also of increasing demand by popularizing veal through advertisement at point of sale.

Stage 1 consisted of four members of the group canvassing retail butchers in the area with two carcasses of prepacked veal. This exercise presented no difficulty.

The second stage, launched in the following May, called for the employment of a salesman visiting retail butchers and caterers over a period of four months in the Bournemouth/Poole area.



A typical quality veal calf, showing the thigh and loin development required by the trade



Carcass appearance is improved by injecting compressed air after slaughter

This, too, was successful, but the final stage has been held up by a shortage of calves. The existing demand for 100 carcasses per week from the Wessex group cannot currently be satisfied, due to the high price of calves which has forced producers to curtail their activities.

The third stage envisaged a producer-controlled prepacking station with its own premises and the formation of a limited company employing its own staff. At least an additional 25 calves per week would have to be guaranteed to justify the employment of the necessary skilled staff. Prepacking so far has been carried out by Bellinger Bros. under the trade name of 'Supa' Veal.

Southampton project

During this period another marketing scheme has been sponsored by the Quality Veal Producers' Association Ltd. This is a national body, whose vice-chairman, Mr. John Cooper of Bridport, Dorset, was also chairman of the Wessex Group during their period of development. Their project was carried out in Southampton, which is not subject to fluctuations in seasonal demand and is therefore considered to be more representative of the probable response on a national basis.

The same salesman was shared by both projects, but in the Southampton area Press advertising and canvassing were used in addition to the trade promotion. In this way it was hoped to assess the value of creating a consumer demand as an adjunct to sales pressure at point of sale. This latter scheme ran for a period of 32 weeks with surveys of the wholesale, retail and catering markets for veal in both areas, before and after the sales drives.

Financial assistance has been received through the Agricultural Market Development Executive Committee, in respect of those aspects of both schemes which are concerned with the promotion of efficient veal marketing. Additional money for the Wessex project has been forthcoming from the

Milk Marketing Board and the Producers themselves and the National Association has further benefited by contributions from feedingstuffs manufacturers and meat wholesalers. The M.M.B. interest stemmed originally from the fact that veal producers were enhancing the value of calves from the dairy herd besides increasing the demand for home-produced dried skim milk. The supply and demand situation has now altered and the significance of these factors has receded.

There is every reason to believe, however, that with the enthusiasm shown by groups and individuals within the veal industry these problems will be overcome, and that the Wessex Group's stage 3 will succeed in some form to provide yet another step forward in producer marketing and sales promotion. The lessons learnt from the consumer research carried out in the present test areas should give pointers to the most appropriate sales techniques to be used for this product on a national scale.

G. A. MANSFIELD
County Livestock Husbandry Officer, N.A.A.S., Dorset

★ ★

EGGS IN SOMERSET

INSPIRED no doubt by their successful producer-owned broiler group, a number of Somerset farmers formed an egg group. That was early in 1961. Today its success can be measured by the fact that the numbers of laying stock kept by its members is over 200,000 head. It is thought that this figure will be doubled in the next two years.

A disciplined and programmed approach to egg production, plus a producer-controlled outlet for their eggs, was a basic requirement. Without infringing the liberty of its members to choose their own breed of commercial layers, the rules provided that egg production should be over a 56-week period, with an enforced rest of one month, free of a laying flock. This rest acts as a buffer period, enabling producers not only to overhaul, disinfect and clean their houses between batches, but should any producer find difficulty in disposing of his flock, he can hold them for an extra week without being embarrassed by the incoming pullets. From a health point of view, this enforced break in production prevents disease being carried over by a live medium to a new flock.

The need of a controlled outlet for their eggs presented no great difficulty to the group, since Suprema Eggs (Somerset) Ltd., a producer-owned packing station, placed its facilities at their disposal right from the start. They have representation on the Packing Station's Board through members who hold an interest in both activities.

It was envisaged that all members should keep at least 1,000 head of laying stock, or anticipate doing so in the near future. As an incentive, a bonus of 5*s.* 9*d.* per case of 30 dozen eggs was paid last year to those who maintained an average pick-up of 300 dozen eggs weekly, with an additional 3*d.* a case to members who elected to receive a monthly cheque instead of weekly payments. One effect of this is that the size of the pick-up by the Station for each call made has shown a sharp increase.

Trading activity

The trading activities of the group are considerable, and this enables the small producers within the group to take advantage of bulk buying, although the benefits obtained are graduated on the basis of cost price less expenses, i.e., on orders for equipment of under £100 a charge of 5 per cent is made; from £100 to £1,000, 2½ per cent; over £1,000, 1¼ per cent.

For food and chicks, considerable variations in the amount of discounts are allowed by the firms concerned. Most chick producers require that orders must exceed 50,000 a year before giving a substantial discount. The discount on both chicks and food is paid to the Group Organizer annually for distribution to members who have bought their food and birds through the scheme.

A paid organizer was appointed as the Group's activities increased; he works in conjunction with the Group and the packing station.

Producers are quite free to select their own suppliers of chicks, but three official pullet rearers have been appointed who are required to confine their activities to pullet rearing only—for preference under controlled environment. No adult birds are allowed on the same farm and, as an additional safeguard, they are allowed to rear only on the batch system, with a complete break of four weeks between batches. This has been successful, but there have been some difficulties; in particular, where egg producers required pullets from several different breeders which, when reared together, added to the risk of disease from the Fowl Paralysis complex. This is now being overcome by insisting that only pullets from one breeder are reared at one time, the hatcheries themselves nominating approved rearers for their own stock.

Amongst other things, the Group Organizer arranges for the disposal, at the best possible price, of the laying flock at the end of its laying season. Many are processed by another producer-owned packing station—Quantock Packers. A projected future development of this service—probably the first in England and one which should obtain better terms for the member—is that prospective buyers and the Group Organizer will be linked by telephone, so making it possible to conduct an auction for the discarded laying flock.

Profit passed to producer

The Group's achievements have extended beyond Somerset. A party of farmers from Brittany studying farming in the county were so impressed by the operation of this Group that on their return to France they set about forming a similar group.

The primary function of the Somerset Egg Group is to ensure a steady controlled throughput of eggs to the packing station, which in turn means orderly marketing, cuts out peak demands for labour and reduces transport charges—all of which makes for profit to be passed on to the producer.

During the last eight months the throughput of the packing station has shown little variation, which indicates that the Group is beginning to attain its purpose. That 60–70 per cent of its eggs are sold pre-packed, either in half- or one-dozen packs under the store's own brand name or that of Suprema, is not only an indication of the present success of the Group, but augurs well for its future.

A. A. EASTWOOD

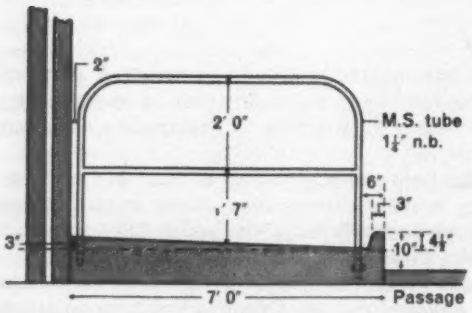
County Poultry Advisory Officer, N.A.A.S., Somerset

***Digest** of an article*

in the winter issue of 'Farming Review', published by Scottish Agricultural Industries Ltd.

Cubicles at Auchincruive

THE West of Scotland Agricultural College has been trying to find the ideal form of cubicle housing for its dairy herd of Ayrshire x Friesians. The existing byre (79 ft × 24 ft) was adapted and the first design, seen here, was introduced. The height of the top rail was so placed in relation to the rear



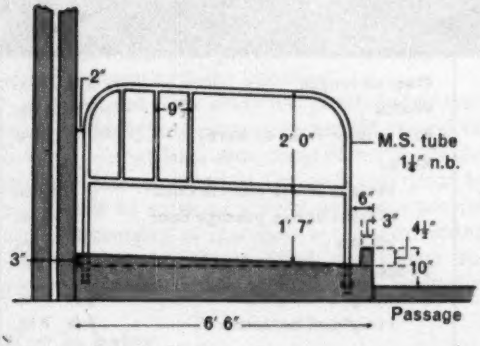
Original design of Auchincruive cubicle floor and division

upright that the cow, when standing, would be unable to overhang and soil an adjacent cubicle. The lower rail is 1 ft 7 in. above the floor level; and this is important, for if raised higher a cow when lying down may well become wedged. A 2-inch gap left between front upright and wall eliminates the danger of a cow's leg getting stuck between the two.

The old central passage was excavated to form a slurry pit 3 ft deep and covered with reinforced concrete slats 10 ft long and 6½ in. deep. The top surface measures 5 in. across, the bottom surface 3 in. The space between slats is 1½ in. The original rather slippery surface of the plain slats was improved by ribbing them and a dusting with carborundum powder; and the sharp edges, which could have led to injury, were rounded.

Forty cows were introduced into the cubicle house in lots of eight. At first it was found that the animals were able to keep themselves clean and required practically no grooming at all, but within a few weeks the cubicles were being soiled by both dung and urine to a greater extent than had been expected. The urine soiling was particularly obnoxious and meant that quite large amounts of wet sawdust had to be removed from the cubicles each morning, thus increasing the consumption of bedding material. The fairly large amounts of dung which collected inside the kerb instead of falling into and through the slats was also a bit alarming and tended to dirty a few of the cows' flanks.

But then an important observation was made—that the cows liked to stand in the cubicles with their heads between the horizontal rails of the tubular divisions. In so doing they moved forward in the cubicle, and thus soiling was inevitable. Three tubular uprights were therefore inserted between the two horizontal rails at the front of the cubicle to prevent the cow standing with her head through the cubicle division. This proved to be the solution to the problem. Contamination by urine was almost completely eliminated and fouling by dung reduced to a very low level.



Latest design of Auchincruive cubicle floor and division

A second cubicle house for 57 cows was completed last summer, the design based on the previous year's experience, as pictured here. The width of the cubicle has been reduced to 3 ft 6 in., so making it possible to install four additional cubicles in the space available.

The three tubular uprights in the cubicle divisions are made of secondhand light-weight tubing. The authors of the original article consider that these uprights should be fitted only where the cubicle floor is level or has a fall from front to rear.

From observations taken throughout last winter it was quite apparent that the Auchincruive design encourages the cow both to stand and to lie well back in the cubicle. The cow is obviously comfortable at all times and has no difficulty when rising.

The authors of the original article are **J. K. Thomson** and **J. E. S. Hall,** Farm Manager and Assistant Farm Manager respectively of the West of Scotland Agricultural College, Auchincruive, Ayr.



AUCHINCRUIVE CUBICLE
LATEST DESIGN

Overall length	**6 ft 6 in.**
Width	**3 ft 6 in.**
Fall in floor (wall to kerb)	**3 in.**
Kerb:	
Height above cubicle floor	**4½ in.**
Height above passage floor	**10 in.**
Width	**3 in.**
Tubular divisions:	
Height of top rail	**3 ft 7 in.**
Height of bottom rail	**1 ft 7 in.**

John Troon

Efficient handling of a farm crop needs the right kind of building

Handling and Building Design

Not so long ago buildings were thought of as being no more than a cover for a particular farm crop or operation. Little attention was given to the sequence of events of which that operation formed only a part. It is now realized that buildings must make a positive contribution to the farming system by taking into account the principles of materials handling and by exploiting the particular properties of those materials.

The basic principles of handling, to which the design of a building should comply, are: no handling is the best handling, handle the biggest possible unit load, make flow processes continuous, and alter the shape or character of the material to assist handling.

Agricultural work study has pointed the road very clearly to an integrated layout. Ideally any processing needed should take place where the material is stored—or at least movement of materials should be kept to a minimum, and the present trend is for each enterprise to have its own storage. Full use should be made of gravity whenever possible, although in general horizontal movement of materials is the most economical.

With these factors in mind, the effects on buildings for storing and processing some typical materials can be studied.

Hay in bales . . .

Hay must be handled in unit loads or have its form changed to induce flow. Unit load handling in bales is now commonplace, but bales cured in the field are exposed to the risk of adverse weather and shattering. There is less risk in drying higher moisture bales in storage. Full-sized bales properly stacked impose no load on the side walls of a building, but for in-storage drying the design of the building must be such as to prevent loss of air around the sides of the hay whilst at the same time allowing sufficient ventilation above the hay to remove the saturated air. A unit load of bales can be dried in a static batch drier, but this necessitates two handlings; one of them can, however, be eliminated by collecting the bales from the field on slatted floor wagons and using a portable drier to deal with groups



Pallet box store under construction in steel and aluminium, with foil-faced insulation

of these wagons. A development of this system is a special building to house the wagons for drying, allowing for recirculation of the drying air and therefore increased drying efficiency.

Reducing the shape of a bale to a small 12-in. cube helps in handling bales in the field and putting them into store, where they can be random stacked by free fall. The side walls of a building on this system must be strong enough to resist the lateral thrust of the bales, and any suspended floor must be able to withstand the impact of free-falling bales.

. . . or chopped

Alternatively, if the hay is chopped it can be blown or elevated into store and dried *in situ*. The same considerations of air tightness and structural strength apply to the side walls, together with adequate ventilation to remove the moisture-laden air. The flow properties of chopped hay can be exploited to allow self-feeding from the storage and drying structure. A cleavage plane is created along the long axis of the building and the hay feeds down, assisted by a flexible swinging gate which agitates the hay when pushed forward by the stock.

Design for grain

The ultimate use of the grain, e.g., long-term storage for sale or for processing as part of a ration, will help to determine the handling system and the method of storage. Grain which is both dried and stored on the same floor requires a building with walls and floor strong enough to support the grain, and with air ducts above or below floor level. Above-floor ducts will restrict the methods of handling out of storage. Previously-dried grain can be stored on a flat waterproof floor. By heaping, the depth of grain on the side walls (and consequently the loading) can be reduced, but for a given tonnage a greater area is required than if stored at a constant depth throughout.

The storage building can be designed to carry the grain load directly on the walls or to form an enclosure for internal storages, the choice being influenced by ultimate disposal. The storage structure can, if required, exploit the flow properties of grain and be designed for self-emptying. But the design must overcome the problem of excessive compaction, which increases the friction between individual grains to the point where all flow

ceases, due to bridging or funnelling. Mechanical devices are available to overcome this problem; but by steeply hoppering the base of the storage beyond the angle of repose of the material, the contents will flow out as a single mass.

Handling potatoes

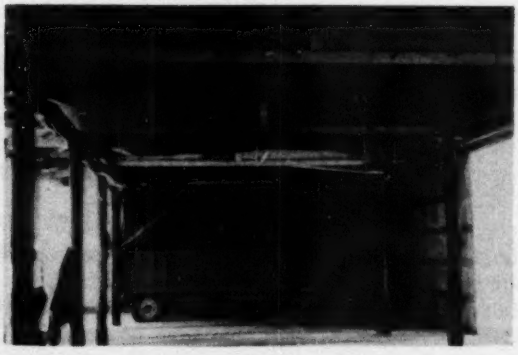
Any potato handling system must keep damage by bruising within acceptable limits. A flow process using conveyors can feed into bulk storage, or the potatoes can be handled in unit loads in containers such as pallet boxes. In bulk storage the walls and floors of the building must be strong enough to withstand the considerable pressures exerted.

With pallet storage, a clear span building will help the movement of fork-lift trucks, and the floor must be sufficiently strong to carry the rolling wheel loads. Lighter construction can be used with pallet storage. This is because of the absence of wall loading. But storage area for a given tonnage will be greater than with bulk storage, and with the latter method internal roof supports can be used in the formation of partitions between bins. A specialist market may affect the degree of insulation and the method of ventilation of the structure, and this in turn may limit the choice of methods of handling in and out of store.

Where washing and grading of the crop is carried out, the potatoes may be given full flow properties and removed from store by means of water flowing through a floor duct or flume.

The alternatives for silage

The choice of direct cut silage (70 per cent or more moisture), wilted (60–70 per cent moisture) or low moisture (less than 60 per cent) will affect the choice of storage. Self-feeding of direct cut material from a horizontal silo eliminates handling out of storage and requires little specialist handling equipment. An alternative to horizontal storage is vertical storage in tower structures, and this requires a short chop material and additional specialist equipment. Even distribution of the crop in the silo is required, particularly in those of large diameter, to avoid the formation of slanting high density pillars which could result in the structure overturning. The design of the silo will decide whether top or bottom unloading can be used to remove the material from store.



Wooden structure housing wagons for drying. The flap valves to the overhead duct are controlled by rope and pulley



A moving-floor wagon feeds chopped hay into an elevator for distribution in barn

The fact that the fibres of silage are weak in vertical tension and horizontal compression can be used to make silage self-feed from a vertical structure by compressing the silage in the horizontal plane. This causes it to break up and fall into a manger at the base of the silo.

The method of handling and the building are interdependent. Field treatment of a material in harvesting limits the subsequent handling and storage and conversely the ultimate disposal of a material may dictate the methods of storing and harvesting. The final choice must not only be possible, it must also be profitable.

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Farm Rents in 1963

The third A.L.S. Enquiry, covering 4m. acres in the autumn of 1963, shows a slowing down in rent increases

FARM rents in England and Wales increased by 7 per cent in 1963, but the rate of increase has progressively slowed down, from 13 per cent in 1960, 11½ per cent in 1961, and 8 per cent in 1962. The average rent per acre of crops, grass and rough grazing in the sample at mid-October, 1963, was £3 7*s.* 6*d.* in England and £1 15*s.* in Wales. The corresponding figures for 1962 were £3 3*s.* and £1 12*s.* 6*d.* In England and Wales together the average in 1963 was £3 3*s.*, compared with £2 18*s.* 6*d.* on the same farms in 1962.

For the 1963 enquiry, rents were obtained for about 19,000 separate farms, representing about 85 per cent of the estate acreage covered in the sample (excluding smallholdings estates). These farms had a rather higher average level of rent per acre than the sample as a whole and a rather smaller proportionate increase in rent in 1963. Nevertheless they do provide an insight into the pattern of the year-to-year change in farm rents.

Changes in 1963

The main reason for the smaller increase in rents in 1963 was that fewer farms than in the previous year had rent increases—19 per cent, compared with 33 per cent. But on these farms rents increased by about the same proportion as in 1962—by 45 per cent to new tenants and 28 per cent to sitting tenants. This brought their average rent to £3 10*s.* per acre, only a little higher (about 2 per cent) than the average new rents in 1962. It thus appears that the increase in the average rent of farm land in 1963 was due mainly to farms being brought up to current rental levels, rather than to any marked increase in those levels.

Small farms had bigger increases in rent than larger ones—36 per cent on farms under 50 acres, compared with 27 per cent on those of 300 acres or more. But this disparity was more than offset by the smaller proportion of small farms which had new rents in 1963—about one-tenth of farms under 50 acres, against a quarter of those of 300 acres or more.

Rents by farm size and region

The level of rent is influenced by many factors such as the quality of land and buildings, climate, the type of farming, the size of the farm and its location. The enquiry distinguishes only two of these factors—farm size and location. An analysis of rent levels on these lines is necessarily incomplete,

but the figures in Table 1 illustrate fairly clearly the influence on rent of farm size and location.

Table 1

Average rent per acre at mid-October, 1963, by region and farm size

Min./Agric. region	Farm size (acres of crops, grass and rough grazing)						
	Under 25	25-49	50-99	100-149	150-299	300-499	500 and over
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Eastern	6 3	4 8	3 16	3 18	4 0	4 1	3 18
South-Eastern ..	4 8	3 9	3 9	3 13	3 13	3 16	3 5
East Midland ..	4 3	3 11	3 3	3 4	3 5	3 5	3 12
West Midland ..	6 1	4 9	4 5	4 3	4 0	3 19	3 1
South-Western ..	5 17	4 1	3 16	3 10	3 14	3 14	3 6
Northern	3 16	3 0	2 17	2 19	2 18	2 17	1 1
Yorks and Lancs ..	5 10	3 5	3 8	3 5	3 2	2 19	2 0
Wales	4 10	2 12	2 8	2 4	1 19	1 9	0 15

The high rents for the smallest farms in all parts of the country partly reflect the fact that the farmhouse and buildings form a higher proportion of the value of the farm where the accompanying acres are few. At the other extreme the low rentals for the largest farms are caused in some regions by the high proportion of the area of such farms that is made up of rough grazings. This tendency shows up particularly in the wetter and more mountainous western half of the country.

Frequency of rent changes

How often do farm rents change on average? Rents cannot by law be changed within a three-year period except by agreement or on a change of tenancy, but Table 2 shows that in practice the period can be either shorter than this or considerably longer.

Table 2

Average rent and year of previous rent change of farms with a rent change in 1963

Year of previous rent change	% of farms	Rent per acre mid-Oct.		% increase
		1962	1963	
		£ s.	£ s.	
Before 1950	1	1 4	2 3	79
1950-1954	6	1 17	2 15	49
1955-1956	7	2 3	3 2	42
1957-1958	22	2 6	3 6	44
1959	14	2 12	3 10	35
1960	26	3 2	3 18	26
1961	14	3 1	3 10	15
1962	10	3 4	3 14	15

Among the farms on which the rent was increased in 1963, the most common year of the previous rent change was 1960. This may reflect a tendency now for rents to be reviewed every three years, but no doubt there was a concentration of rent changes in 1960 as a consequence of the Agriculture Act, 1958. As might be expected, the longer it was since the previous rent change, the greater was the per cent increase in rent when it did change. Even so, these figures suggest that for one reason or another new rents are not always brought right up to current levels if they have been very out of date. For example, it appears that, other things being equal, a 100-acre farm which had not had a rent increase since the early 1950s would have had to provide an extra £165 a year if its rent had been brought right up to current levels; as it is, the additional rent was £90.

Forage harvesters fall into two main groups—Flail and Chopper. Both types are capable of cutting and conveying the material into trailers, either attached behind the harvester or towed alongside

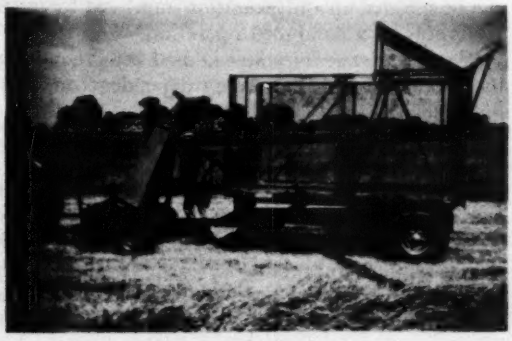
Flail Forage Harvesters

G. E. TOOBY

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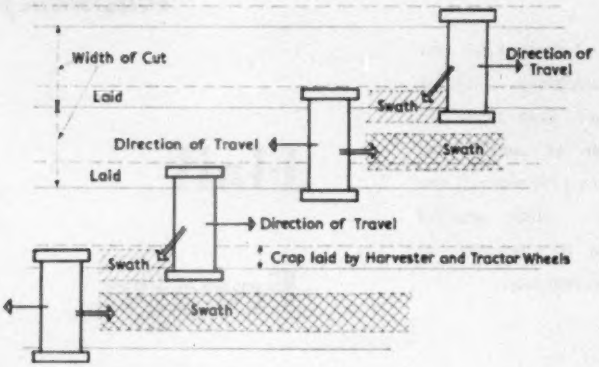
T. D. DEWES

THE flail forage harvester is basically a mobile fan; the fan is commonly known as a rotor, with cutting flails attached. The forage harvester is noted for its rapidly increasing horse-power requirement with increase in rotor speed, so the rotor speed should be kept at the minimum commensurate with cutting and lifting the crop. Recommended speeds are between 1,000 and 1,500 r.p.m. It is also essential to have the correct pulley ratio on the final drive, in order to maintain these speeds without having to use excessive throttle. Correct rotor speed leaves horse-power available for maintaining a maximum constant forward speed. Irregularities in crop density should be overcome by taking a narrower cut rather than reducing forward speed.



Silage the modern way

Pre-cutting with a 40-inch in-line forage harvester



Shear plate adjustment should be to within ¼ inch of the flail tip, so giving the flails a greater throwing efficiency and allowing higher output with only a slight increase in power consumption.

To keep the machine efficient, a sharp cutting edge on the flails must be maintained. This is done by using an emery wheel and keeping the same cutting angle as when new. At no time should the pitch of the flail be altered from its original shape; it is far better to fit new flails than attempt to recondition them by heating. The shear plate should also be kept sharp by the same method.

In reasonable conditions, the output of a machine kept in good trim should be up to ½ ton/hour/h.p. available at the P.T.O. but in a heavy, wet and dense crop this could be reduced to less than ⅓ ton/hour/h.p. The loading rate can, therefore, be 10–15 tons/hour with a tractor having 20–25 h.p. available, and 15–20 tons/hour with one having 40 h.p. available.

Higher dry matter silage calls for wilting. A given crop will yield a known quantity of dry matter. If the crop is wilted, not only will there be less loads per acre, but nearly always more dry matter per load.

The crop is pre-cut, either with a mower or forage harvester. An inside swath-board is needed on a mower when picking up with a 40-inch harvester. If the crop is picked up directly from the swath, there is a risk of under-laceration and consequent difficult handling at the silo. The drying rate can be speeded up and laceration improved by tedding, crimping or crushing, preferably as a combined operation.

Where a forage harvester is used for pre-cutting, the swath wilts quickly, the evenness of wilting being dependent on how the swath is left by the machine.

To control fermentation in the silo when wilting, the filling and consolidation must be kept going quickly until complete. Alternatively, a narrower silage face can be used, possibly by forming a division down the centre of the silo, so that a good depth of material can be loaded in. To get a high input rate, if pre-cutting with a forage harvester, another harvester, tractor and man is required. This harvester would be fitted with a haymaking attachment and would operate at a slower rotor speed and could subsequently be used for hay cutting.

Where the tonnage of silage is around 150–250, one machine can be used for pre-cutting and picking up. Dual-purpose machines with alternative chute positions and variable rotor speeds are available. When a 40-inch in-line machine is used for pre-cutting, it is essential to place two swaths side by side if the wheels of the harvester and trailer are not to run down the centre of the adjacent swath when picking up. This does not arise with a 60-inch machine. A canvas stocking from the top of the chute down to a metal tray which can be swung from side to side will lay two swaths together. These can be picked up in one pass of the machine, giving a very fast loading rate, and the same quantity of dry matter can be loaded into the silo in a working day as with direct cutting.

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The Ministry's Publications

Since the list published in the March, 1964, issue of *Agriculture* (p. 131) the following publications have been issued.

ADVISORY LEAFLETS

No. 526. Bedding Plants (New)

OTHER PUBLICATIONS

Experimental Husbandry No. 10 (New) 7*s.* (by post 7*s.* 6*d.*)

The subjects reported in this issue include fertilizer trials on grass and root crops, and a comparison between the improvement of pastures by the use of fertilizers and by reseeding.

Review of the Persistent Organochlorine Pesticides (Report of Advisory Committee under Sir James Cook) 4*s.* 6*d.* (by post 4*s.* 11*d.*) see p. 194.

FREE ISSUES

Obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner.

Horticultural Management—How to keep records and how to use them (New)

To help with farm records

Every farmer these days keeps some kind of farm records. The pertinent question is what kind of records. Some farmers are content with the minimum needed statutorily or for tax purposes; others wish to use records for the business management of their farms. The N.A.A.S. and University Departments of Agricultural Economics have for years now been concerned with improving methods of farm business management and to show how records for such purposes can be kept systematically.

So a book of *Farm Business Records* has been designed which provides data sheets all ready for use. This can be obtained from any branch of the National Farmers' Union, price 21*s.*, with a free explanatory booklet.

The booklet can be obtained separately from the Ministry's office at Pinner.

15. East Dorset

M. J. Bourne

THE East District of Dorset embraces with its western boundary a large proportion of the rolling chalkland of the county. To the south-east, the chalk slopes gently to a narrow belt of clay and variable-textured, ill-drained loams. This culminates in a vast area of heath-type soils on the Bagshot Sands and Plateau Gravels which extend far to the east over the Hampshire border and surround Poole Harbour. The south of the district is dominated by the hard chalk and limestone Purbeck Hills, with a rugged, inaccessible coast line. The climate is mild and humid, the average rainfall ranging, east to west, from 20 to 35 inches.

In the past, the economy and fertility of the large chalkland farms were based on the Dorset Horn and Down breeds of sheep which roamed the Downs and were close folded on roots. But the 'golden hoof' has now been abandoned in favour of the dairy cow and cereals. The large fields and open spaces lend themselves to cereal growing, and this has been encouraged by the introduction of modern varieties, combine harvesters, compound fertilizers and herbicides. Potash in particular was a limiting factor on the capacity of the land to grow corn. Some of the farms now practise almost continuous cereal growing with little apparent ill-effect. The grassland ewe flock is increasing and there is a tendency to get away from the dairy cow. Herbage seed growing plays an important part on a few of the farms.

The chalk soils are shallow and hungry on top of the Downs, but lower down the slopes and in the valleys they give way to deeper and more productive loams. Throughout the chalk there are areas on the hilltops covered with two to four feet of clay with flints, giving rise to a heavy but reasonably productive loam. The terrain is broken by woodland or copses of oak, ash and hazel on the clay with flints and chestnut on the deeper chalk, but the thinner chalk supports only small thorn bushes and gorse.

The soils of the Reading Beds and Oxford Clay, south-east of, and overlying the chalk, vary from light sandy to heavy loams and most of the farms have a sample of each, with the consequent drainage problems and difficulties of cultivation. The farms are smaller and milk forms the basis of the economy,

although there are some cereals on the larger units and often subsidiary enterprises of pigs and poultry. The Holt Vale, north of Wimborne, typifies the nature of the area and the farming system. The land was originally oak forest, and small areas of this persist today.

Half the total land area of the district is occupied by Bagshot Beds and Plateau Gravel. Much of it is barren heath, but a considerable acreage has been reclaimed in recent years. Large tracts are afforested with conifers, mainly by the Forestry Commission. Bovington Heath is a Tank Training area and Winfrith Heath contains an Atomic Energy Research Station. Even so, there are many farms on these light, poor sandy loams, especially where the soil is a little deeper and the water-table not too far below the surface. Most of these farms are small and rely on milk production, with subsidiary pig and poultry enterprises. There is an abundance of small livestock producers in the hinterland of Bournemouth. A few larger holdings derive most of their income from beef, sheep and pigs. Efforts to grow cereals have not been too well rewarded, though a fair crop of rye can be grown. Crops often suffer from trace element deficiencies, especially where over-liming has been practised.

The Isle of Purbeck is bounded by Poole Harbour and the River Frome to the north, Luckford Lake, a small stream running north from East Lulworth to join the Frome, to the west, and the English Channel to the south and east. It is of special interest to naturalists; biologists and geographers come here from all parts of England to study in pleasant surroundings. The northern half of the area is on Bagshot Sands, which run eastwards to Studland Bay. The complex geology of the remainder, with its east–west chalk and limestone hills, means that there is a variety of soils from light sandy to heavy clay loams. Drainage is often a problem, even on the lighter soils, the water coming to the surface as springs and spring-lines. Small-to-medium sized farms predominate but there are a number of large farms where cereal growing plays a major part in the economy, along with milk production. The land is subject to drought in a dry summer, especially on the clay tops and slopes of the hard limestone hills of the Portland and Purbeck Beds where the soil is shallow.

Apart from cereal growing on the large farms on the chalk, the dairy cow provides the main source of income in the district. Friesians predominate and kale and silage figure largely in the feeding programme. As the number of cows increased, the existing buildings became inadequate and the milking bail and parlour came into general use. The cows were outwintered, strip-grazed on kale, and silage was carted out to the fields. The Farm Improvement Scheme has done much to accelerate the swing towards taking cows off the land in winter and housing them under covered yards, with self-feed silage supplementing the autumn grazing of kale.

Horticulture must not go unmentioned. The proximity of the Bournemouth market, the light sandy soils of the Bagshot Beds in the hinterland of Bournemouth, and the particularly favourable climate associated with that pleasant resort, make the area particularly favourable for the production and marketing of vegetable, glasshouse and nursery produce. The large-scale production of watercress thrives in the water from the chalk streams which run through the district. The produce is sold mainly in the markets of the North and the Midlands.

MICHAEL F. TILLEY
Agricultural Land Service, London

Choosing a Piggery

ANYONE aiming at fattening pigs is faced with an embarrassing choice as to the kind of accommodation in which to do the job. Why is this so? Why is it not possible to evolve a 'standard' type of piggery universally applicable in the same way that we now have a standard type of cowhouse and (practically) a standard type of milking parlour?

There are, I think, two reasons for this, one historic, one practical. The historic reason is that only fairly recently has pig farming become big business and been subjected to the close scientific analysis which a large-scale enterprise warrants. Large-scale dairy farming has been practised for far longer and has had time to make its mistakes and profit by them.

The practical reasons are more complex. They arise from two main causes. Firstly, the nature of the end product can vary quite a lot. A farmer who is aiming at the porker and baconer trade needs a different sort of building from the farmer who is selling heavy hogs. There are also quite a number of arable farmers who have turned to pigs as a more profitable method than beef of making a muck from their straw. The economics of this is being increasingly questioned by those who argue that it is cheaper to get fertilizer out of the bag, but the instinct to return natural fertility to the land is still very strong. Many prefer this method. This again needs a different type of piggery.

Secondly, the scale of production affects the choice of piggery. Large-scale producers want not only a larger piggery but also a different type from that of the man who keeps a few pigs as a side-line. With a few sows, all farrowing at different times, it is usual to keep litters separate right through the fattening house, and pens to hold eight to twelve pigs each are necessary. With large-scale production and several sows farrowing at much the same time it is possible, after weaning, to group piglets of the same size and weight from several litters into batches of 20–30 or even 40 pigs at the fattening stage. Generally speaking, it will be cheaper to house pigs this way if the enterprise is large enough for it to be done without too great a difference in weights and the risk of bullying which results. There will be

fewer division walls and pen gates. It will also probably help to reduce the labour costs, since a pen housing 32 pigs will be quicker and easier to feed, muck out and generally manage than four pens housing eight pigs each.

The decisions, therefore, to be taken at the beginning, before worrying too much about details like floor feeding or slatted dung passages, are how big the enterprise is to be and what sort of pig you intend to produce. This is not to say that it is impossible to produce baconers in a strawyard, though their quality and conversion rate may leave much to be desired; or that it is impossible to produce heavy hogs in small groups on a rationed basis. They are, however, unlikely to be as economic as if they were housed in the right sort of building. When these two points have been settled a number of the other questions will answer themselves and the embarrassing choice outlined above will be very much less.

Good housing pays

There are three features of pig housing which have aroused considerable interest recently—control of environment, floor feeding and slatted dung passages. All three apply, to a greater or lesser extent, to whichever type of fattening house is selected.

There is ample scientific evidence to prove that conversion rates will be better and the incidence of disease lower in a piggery where the pigs are kept at a constant temperature of between 55–60°F. This is not difficult to achieve if the pigs are housed at the correct density in a well-built, insulated building and some reasonable measure of control is kept on the ventilation. There are still many piggeries where it is not yet achieved. The ideal of a fully-insulated piggery with fan-controlled ventilation may seem too expensive. Whether it is an economic proposition or not will depend not only on the building but also on the skill of the management and the quality of the breeding stock and their conversion potential. Just putting bad pigs into a good building isn't going to turn them into good pigs. Good stock will, however, always pay well for being well housed.

Floor feeding, as opposed to trough feeding, will do little for the stock, though there are those who claim improved conversion rates. But it will remove the considerable initial expense of the troughs and allow practically double the number of pigs to be housed in the same space. The pen shapes can also be more flexible, since it is no longer necessary to provide a trough length of 9–12 inches per pig. The pen can be made whatever size and shape circumstances dictate. This is particularly useful when converting existing buildings. Floor feeding well planned also leads to considerable saving of labour and lends itself readily to mechanized, rationed feeding.

Slatted dung passages, properly planned, save labour. They also save space, since they can be—indeed must be—made smaller than the usual dung passage for the action of the pigs' feet to keep the slats clean. But the story does not end at the piggery door, and unless well thought out methods are provided for storing and disposing of the slurry, slats are best left alone. Slats need not, however, involve the building of vast underground storage tanks. Above-ground tanks will be far cheaper with a sludge pump to lift the slurry out of a dung trench running beneath the slats.

Annual Review, 1964

A Short Guide

THE results of the 1964 Annual Review and Determinations were published in a White Paper (Cmnd. 2315)* on 18th March, 1964.

DEVELOPMENTS IN AGRICULTURAL POLICY

The White Paper refers to the progress which has been made in implementing the Government's policy of securing greater stability in our market for cereals and fatstock. The intention is not to raise market prices generally by restricting supplies but to ensure that the support system is not undermined by excessively low market prices leading to heavy demands on the Exchequer.

To date, a bacon market sharing agreement has been signed, overseas suppliers have agreed in principle to minimum import prices for cereals and, as a counterpart to these import arrangements, standard quantities are to be introduced for home-produced wheat and barley. It has not been possible to reach agreement with our overseas suppliers on the Government's proposals concerning meat imports but the Government will continue their efforts to secure comprehensive arrangements and meanwhile will seek the co-operation of suppliers in phasing supplies. The Government reaffirm their support for the Kennedy Round negotiations in the G.A.T.T. and will continue to work for the successful conclusion of international commodity agreements.

The achievement of greater stability in our market will provide a better basis for improvements in home marketing to which the Government attach great importance.

The White Paper makes clear that the Government's objective is to relate supplies to the needs of the market, and to ensure a proper balance between home production and imports. On the assumption that these objectives are achieved the Government will be able in determining the basic guaranteed prices at Annual Reviews to give greater weight to the level of farmers' returns than would have been possible in the absence of such arrangements.

DETERMINATION OF GUARANTEES

The exceptionally harsh winter of 1963 adversely affected lambing and litter rates, upset the calving pattern, reduced milk output and affected crop yields. Nevertheless, the rising trend of agricultural net output is expected to continue though the forecast for 1963/64 at 127 (average of 1954/55 to 1956/57 = 100) shows a slower rate of increase compared with revised figures of 125 for 1962/63 and 117 for 1961/62.

Actual net income is forecast at £406½ million in 1963/64 compared with a revised estimate for 1962/63 of £445½ million. Adjusted for normal weather conditions, the forecast for 1963/64 is £429½ million compared with the revised estimate for 1962/63 of £438 million, £420½ million in 1961/62 and £394½ million in 1960/61.

The net cost increase on Review commodities is about £24 million—mainly increases in labour, feedingstuffs and rents offset by reductions in fertilizer and machinery costs. Against this must be set the £25 million which has again been taken as an indication of the rise in farm incomes due to increasing efficiency.

Exchequer cost in 1962/63 was £310 million. In 1963/64 it is expected to fall to £301 million but the estimate for 1964/65, adjusted for determinations at this Review, is £327 million.

Changes in guaranteed prices are shown in Table 3 (pp. 192 and 193).

MILK. Against the background of a decline in the size of the dairy herd in 1963/64, an expected reduction in production and the expectation of a slower rate of increase for milk yields, the Government have found it possible to bring about a much-needed increase in milk-producers' incomes. The guaranteed price has accordingly been increased by 2½*d.* and a further ½*d.* will be added to finance the Milk Marketing Boards' compositional quality schemes.

FAT CATTLE. To maintain home supplies of beef the guaranteed price has been increased by 3*s.* per live cwt, and the calf subsidy increased from 1st January, 1964, by 10*s.* for steers.

*H.M. Stationery Office, price 3*s.* by post 3*s.* 4*d.*)

Table 1

Estimated gross output of agriculture in the United Kingdom[1]
Years beginning 1st June

	£ million			£ million	
	1962/63	1963/64 forecast		1962/63	1963/64 forecast
TOTAL FARM CROPS[2]	335·5	308·5	TOTAL LIVESTOCK AND LIVESTOCK PRODUCTS	1,136	1,150·5
Wheat	99	72·5	Total Fatstock	509·5	516
Barley	90	104·5	Cattle	242·5	255
Oats	9	8	Calves	4·5	4
Potatoes	93	77	Sheep and lambs	84	81
Sugar beet	30	31·5	Pigs	179	176
Hops	7·5	8	Milk and milk products	361·5	374·5
Other	6·5	6	Eggs[3]	171	165·5
TOTAL FRUIT, VEGETABLES AND FLOWERS	167·5	164	Poultry[4]	75	77
Fruit	52	45·5	Wool	17	16
Vegetables	86	88	Other	2	2
Flowers and nursery stock	29·5	30·5	CHANGE IN STOCKS[6]	—9·5	—1·5
OTHER OUTPUT[5]	31·5	30	TOTAL	1,661	1,651·5

[1]In Great Britain from holdings of over one acre only; in Northern Ireland one acre and over.
[2]Includes sales of crops for feed.
[3]For food and for hatching.
[4]For food and for stock.
[5]Includes deficiency payments for barley, oats and mixed corn not sold off farms.
[6]Value at market prices of changes in the volume of stocks and work in progress.

NOTE.—Because of rounding, sums of constituent items do not always coincide with totals as shown.

Table 2

Estimated farming net income in the United Kingdom
Years beginning 1st June

	£ million			£ million	
	1962/63	1963/64 forecast		1962/63	1963/64 forecast
FARMING NET INCOME	445·5	406·5			
TOTAL EXPENDITURE	1,362	1,390·5	TOTAL REVENUE[5]	1,807·5	1,797
Labour	307	310·5	Farm crops	333	309·5
Rent	120	127·5	Fatstock	510	515·5
Machinery:			Milk and milk products	361·5	374·5
Depreciation[1]	80	79	Eggs and poultry	246	242·5
Fuel and oil	47·5	47	Horticultural products	167·5	164
Other	93	94	Other products	50·5	48
Feedingstuffs[2]	403	400·5	Production grants and other credits	117	113·5
Fertilizers	108·5	119	Valuation change[6]	22	29·5
Seeds[3]	32·5	31·5			
Imported livestock[4]	66	72			
Other expenses	104·5	109·5			

[1]Estimated provision for machinery and vehicles, at replacement cost.
[2]Gross value of bought feed whether home-grown or imported.
[3]Imported seeds plus merchants' margins on home-grown seeds.
[4]Imported livestock plus transport and merchanting changes on inter-farm sales of home-bred livestock.
[5]Estimates in Table 1 are here adjusted for changes in stocks awaiting sale. Includes receipts from sales of crops for feed.
[6]Increase in value at cost of stocks and work in progress.

WOOL. The guaranteed price has been increased by 2*d.* lb.

FAT PIGS. The Government have raised the middle band of the flexible guarantee scale by ¾ million in view of the strength of the pigmeat market and so that the band can reflect the quantitites which the market can absorb at reasonable prices. But, so that the resultant rise in producers' returns should not jeopardise the stability of the breeding herd, the basic guaranteed price has been reduced by 6*d.* per score leaving producers with a net improvement of 1*s.* 3*d.* per score on their present price.

EGGS. Production is expected to expand more rapidly than demand leading to lower market prices. The guaranteed price has been reduced by 1*d.* per dozen.

POTATOES. The potato acreage remains below the desirable level and the guaranteed price has been increased by 5*s.* per ton.

SUGAR BEET. The guaranteed price has been increased by 3*s.* 4*d.* per ton.

PRODUCTION GRANTS. The fertilizer subsidy has been reduced by £2 million and the rate of winter keep grant increased by £1 per acre.

In addition to the price changes there are important changes in the guarantee arrangements for cattle, sheep and cereals. For fatstock, to increase the influence of market prices on producers' marketing decisions, deficiency payments will be supplemented when market prices are good and abated when the market is weak. If the average of producer returns over the year does not reach the guaranteed price, the difference will be paid at a flat rate on all certifications over the year. For cereals, there will be minimum import prices, and as a counterpart for home-produced wheat and barley there will be a system of standard quantities and target indicator prices.

Guaranteed Prices

Table 3

LIVESTOCK AND LIVESTOCK PRODUCTS

Commodity	(i) Guaranteed Prices 1963/64 determined after the Annual Review, 1963	(ii) Price change compared with the 1963 Annual Review Guarantee	(iii) Guaranteed Prices 1964/65 determined after the Annual Review, 1964
Fat Cattle (per live cwt.) (*a*)	167*s.* 0*d.*	+ 3*s.* 0*d.*	170*s.* 0*d.*
Fat Sheep and Lambs (per lb estimated dressed carcase weight) (*a*)	3*s.* 2*d.*	No change	3*s.* 2*d.*
Fat Pigs (per score deadweight) (*a*) (*b*)	44*s.* 11*d.* related to a feed price of 25*s.* 11*d.* per cwt. On the basis of the current feed price of 27*s.* 7*d.* per cwt this guaranteed price is equivalent to 46*s.* 7*d.*	— 6*d.*	46*s.* 1*d.* related to a feed price of 27*s.* 7*d.* per cwt.
Eggs—hen (per dozen)	3*s.* 8·53*d.* related to a feed price of 25*s.* 1*d.* per cwt. On the basis of the current feed price of 26*s.* 8*d.* per cwt this guaranteed price is equivalent to 3*s.* 9·86*d.*	— 1*d.*	3*s.* 8·86*d.* related to a feed price of 26*s.* 8*d.* per cwt.
Eggs—duck (per dozen)	2*s.* 4·46*d.* related to a feed price of 25*s.* 1*d.* per cwt. On the basis of the current feed price of 26*s.* 8*d.* per cwt this guaranteed price is equivalent to 2*s.* 5·79*d.*	No change	2*s.* 5·79*d.* related to a feed price of 26*s.* 8*d.* per cwt.
Wool (per lb)	4*s.* 5·25*d.*	+ 2*d.*	4*s.* 7·25*d.*
Milk (average per gallon)	3*s.* 2·35*d.*	+ 2·5*d.* (c)	3*s.* 4·85*d.* (c)

Table 3 (continued)

CROPS

Commodity	(i) Guaranteed Prices for 1963 Harvest determined after the Annual Review, 1963	(ii) Price change compared with the 1963 Annual Review Guarantee	(iii) Guaranteed Prices for 1964 Harvest determined after the Annual Review, 1964
Wheat (per cwt) (*a*)	26*s.* 6*d.*	No change	26*s.* 6*d.*
Barley (per cwt) (*d*)	26*s.* 8*d.*	No change	26*s.* 8*d.*
Oats (per cwt)	27*s.* 5*d.*	No change	27*s.* 5*d.*
Rye (per cwt)	21*s.* 7*d.*	No change	21*s.* 7*d.*
Potatoes (per ton)	275*s.* 0*d.*	+ 5*s.* 0*d.*	280*s.* 0*d.*
Sugar Beet (per ton, 16·0 per cent sugar content)	124*s.* 8*d.*	+ 3*s.* 4*d.*	128*s.* 0*d.*

NOTES ON PRICE TABLES

(*a*) The guaranteed prices for fat cattle, fat sheep and wheat are average prices subject to variation seasonally; the guarantee payments for fat cattle and some fat pigs are subject to variation according to quality; and the method of calculating the fat pigs guarantee payments involves an element of estimation. Because marketings and prices of fatstock and wheat may vary from those forecast, producers' average returns under the guarantees for those products in any year may differ slightly from the guaranteed prices.

(*b*) The guaranteed price for pigs is subject to the flexible guarantee arrangement.

(*c*) The guaranteed price for milk determined for 1964/65 includes 0·25*d.* per gallon special assistance for compositional quality.

(*d*) The guaranteed price for barley is subject to arrangements whereby, to encourage a more even spread of marketings over the season the deficiency payments are subject to premiums for barley delivered, after sale, in the later months of the cereal year and deductions for barley delivered in the early months of the year.

'U.K. Dairy Facts and Figure, 1963'

It would not be true to say that a dairy farmer can't produce milk without this book, but if he is interested in the industry as a whole, the legislation on which it is run, the trend of prices and the sheer colossal gallonage which it handles, he will not hesitate to send for a copy. This is the first of a new series produced by the five Milk Marketing Boards that make up the Federation of U.K. Milk Marketing Boards, and can be obtained from Thames Ditton, Surrey.

IN BRIEF

Organochlorine Pesticides

The Advisory Committee, under the chairmanship of *Sir James Cook*, which has been reviewing the use of persistent organochlorine pesticides has made its report*. The recommendations are:

1. the use of aldrin and dieldrin in fertilizer mixtures should cease as soon as this can be arranged;
2. the use of aldrin and dieldrin in dips and sprays for sheep should cease as soon as this can be arranged;
3. (*a*) seed dressings containing aldrin, dieldrin and heptachlor may continue to be used, but only on (i) winter sown wheat (up to the end of December) where there is a real danger of attack from wheat bulb fly, and (ii) on rubbed and graded sugar beet seed for precision drilling;
   (*b*) aldrin and dieldrin may be available for commercial use only (i) against wireworm in potatoes, (ii) to control cabbage root fly and (iii) to control narcissus bulb fly;
   (*c*) dieldrin may be available to control cockroaches and tropical species of ants;
4. all other current uses of aldrin, dieldrin and heptachlor in agriculture, horticulture, home gardens and food storage practice should cease as soon as this can be arranged;
5. the uses listed in recommendations 3(*a*), (*b*) and (*c*) above should be reviewed at the end of three years with a view to their discontinuance;
6. no restrictions should be placed on the current uses of DDT in agriculture, horticulture, home gardens and food storage practice, but its use should be reviewed at the end of three years;
7. no restrictions should be placed on the current uses of BHC (including gamma-BHC) in agriculture, horticulture, home gardens and food storage practice;
8. the hazards possibly arising from the use of organochlorine pesticides for purposes other than in agriculture, horticulture, home gardens and food storage, including any contribution which these uses might make to the general environmental contamination by organochlorine pesticides, should be studied without delay;
9. governmental and other bodies should intensify their efforts to encourage by education and advice the use of the less persistent pesticides, and to encourage economy in the use of persistent organochlorine pesticides where these may continue to be used.

**Review of the Persistent Organochlorine Pesticides*. H.M. Stationery Office, price 4*s.* 6*d.*

A day at The Royal

Royal of England is the title of an interesting 20-minute colour film which has been made for the R.A.S.E. by the Perkins Group, Peterborough. A short introduction sketches the Society's origin a century and a quarter ago, before presenting the ramifications of the Society's present-day enterprise and industry. Several of the film sequences have been shot at the R.A.S.E.'s new permanent showground in the beautiful setting of Stoneleigh Abbey. With so much going on of farming interest and spectacular display, a day at The Royal is seen to be all too short. Because the R.A.S.E. offers so much to so many, they might consider amending their world-known motto to—*Relax with Science.*

Copies of the film (16 mm) can be borrowed free from the Press and Public Relations Officer, Royal Agricultural Society of England, 35 Belgrave Square, London, S.W.1, or the Film Library, Perkins Group, Peterborough.

Grafting extends the Tomato Season

Every tomato grower knows that he cannot go on cropping his glasshouses with tomatoes without doing something to control the build-up in the soil of pests and diseases, otherwise yields will drop to a pound or two per plant. Since the 1920s the traditional method of restoring soil fertility has been steam sterilization (more correctly, partial sterilization) which, in spite of being costly, £500–£600 per acre, is still the best.

On holdings with only a small glasshouse area steaming is difficult and capital investment high for equipment which will be used for limited periods. Chemicals are effective for only one year, and the glasshouse must be left uncropped for six to ten weeks after treatment. This means the loss of a crop at a time when the houses are most valuable. Breeding varieties with genes resistant or immune to soil fungi and pests and transferring them into acceptable varieties of the cultivated tomato (*Lycopersicon esculentum*) is a long job for plant breeders.

By the new grafting technique, developed in Holland at the Naaldwijk Glasshouse Crops Research Institute in 1958, very vigorous disease-resistant F1 hybrids are produced as rootstocks. On to these the grower grafts his usual commercial variety as scion. Millions of these grafted plants have been produced in Holland, and their numbers are increasing over here. For the grower who cannot steam his soil, grafting gives increased yields.

At least three rootstocks are now available from commercial seedsmen, and it is claimed that all carry genes resistant to Corky Root and Didymella; one of these is also resistant to Verticillium wilt and Fusarium wilt, another incorporates resistance to some species of root-knot nematode. There is no loss of a winter crop in the growing-house, and the return will more than offset the costs of seed, grafting, and heating the extra propagation space required. The total figure should not exceed £200 an acre.

At Cleppa Park Experimental Horticulture Station in South Wales, grafted tomatoes yielded 8–10 lb of fruit (48–54 tons acre) as against 1½–2 lb on the ungrafted plants. Similar results have been seen at other stations. Results obtained by growers have been as good or better, and they have found that grafted plants extend the tomato season.

THE TECHNIQUE

Briefly, the technique involves the timing of seed sowing to produce rootstock and scion plants at the same time, with a stem thickness of ¼ in. and a height of about 4 in.

Cut off the head of the rootstock, leaving one or two pairs of leaves—make a downward cut in the stem through rather more than half the stem thickness and about ½ in. long. Make an upward cut of the same size and angle in the scion, but rather less in depth. Bring the cut surfaces together and hold them lightly but firmly whilst binding with adhesive tape or a strip of lead tinfoil. Then pot up the plants together.

The graft should take in 10–14 days, and then the root of the scion is severed between the root and graft. This may be delayed until after planting, unless Didymella, Verticillium or Fusarium wilt are present in the glasshouse soil. If they are, sever before planting.

The rootstock will have a vigorous spreading root system in soil where ungrafted plants would have poor roots. Feeding and watering have to be modified to suit requirements of this type of plant.

L. R. S. Cook

Colorado Beetle in 1963

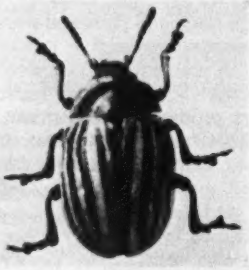
1963 was the eleventh successive year in which there was no outbreak of Colorado beetle in England and Wales. It was also a year in which remarkably few adult beetles, accidentally introduced, were found with imported produce. Of the six beetles discovered, four live ones were on fruit and vegetables: one on potatoes from the Canary Islands, one on lettuce, and one on pears (both from Italy), and one on a pile of vegetable refuse in a street in Covent Garden. Another live beetle was found on a ship that had been on a Mediterranean cruise and had victualled with fruit and vegetables at Lisbon, and the sixth was found in a boat sailing from the Great Lakes to Southampton, calling at Le Havre before going on to London. The beetle found on Canary Island potatoes is difficult to explain because the insect is not known to occur in the Canaries.

Colorado beetle continues its spread to the east and south-east of Europe. In 1963 it was reported by the European and Mediterranean Plant Protection Organization to have bred in Turkey, in the Western province of Edirne, and in Greece in the northern areas bordering Yugoslavia.

The Ministry again thanks all those who have reported and sent in Colorado beetles. It is still important that any 'suspects' should be reported promptly.

COLORADO BEETLE

Slightly less than ½ inch long. Black and yellow stripes run down the wing cases



The grub, at first brown, later becomes a bright pink, with two rows of black dots along each side

Books

Animal Machines. RUTH HARRISON. Vincent Stuart. 21*s*.

Intensive farming involves keeping animals in crowded and controlled conditions, very different from those of the natural state. Not all the methods of intensivism are new but many people are worried by the scale on which they are now practised. Mrs. Harrison is appalled by them, and she deals at length with broilers (their rearing and slaughter), layers, veal calves, pig 'sweat houses', and slats for any cloven-hoofed animal.

Pain and discomfort are inseparable from life, but most people would agree with her that in husbandry there is an obligation not to add to pain, nor to occasion any considerable discomfort.

There is room for disagreement when it comes to confinement in an artificial environment. Mrs. Harrison argues that an animal has a right to fresh air and sunshine, but she ignores the penalties which accompany these in the wild state, or even in extensive farming; varying degrees of hunger, frequent fear, anguish from predators and parasites, and suffering from severe weather.

Intensivism banishes these or reduces them to the lowest possible level. We cannot judge an animal's reactions to its surroundings by our own. We accept the buffetings of freedom but we do not know where an animal, living from moment to moment, would strike the balance. We can only judge by whether the animal thrives and has the appearance of well-being. These criteria are generally satisfied under intensivism.

Mrs. Harrison is not only concerned with the cruelty which she alleges animals suffer in modern farming; she maintains that the food they provide lacks quality and is nutritionally inadequate. This is familiar ground. Much has been claimed for the mysterious quality of 'natural' food, but no one has been able to detect it scientifically, and statistics provide no evidence whatever of its existence. We may well have lost some of the joys of eating by slaughtering animals at earlier ages, but the majority of people apparently rate tenderness above flavour.

This book will cause distress to many well-meaning persons. Those familiar with modern farming will recognize that it is emotional and one-sided in its approach and contains much that it is easy to refute, but few will regard the book as of no account. It is always salutary to have to justify one's actions, and farmers will agree that in intensivism, as in other forms of livestock husbandry, there are limits that should be set. To define these limits is a supremely difficult task.

H.G.S.

Farm Effluents: A Guide to Landowners and their Advisers. L. W. GEE and J. E. MAHER. The Country Landowners' Association. 3*s*. 6*d*. (*including postage*).

With sections outlining the legal position, how to comply with the law, methods of disposal and finance, this short guide to the problems of effluent disposal, which is free to members of the C.L.A., should also be useful to occupiers.

Though brief, the first section summarizes the legal position in a commendably helpful way which the layman should have no difficulty in understanding.

There are explanations of the way of defining the toxicity of effluent and of how natural purification by bacteria occurs, and the warning is given that dilution with clean water is no solution to the problem.

The part of the booklet describing methods of disposal will probably be of most practical interest. This deals with discharging effluent into public sewers, its treatment, and returning it to the land. In a summary of the alternatives available, the authors rightly point out that there is no 'best' way of effluent disposal, and the conditions on each farm must be studied carefully to find the most satisfactory and economical answer. In a foreword, Lord de Ramsay, President of the C.L.A., reinforces this advice by emphasizing that there is no general solution, and he suggests that the C.L.A., the new River Authorities, the A.L.S. and N.A.A.S. can all help with their advice.

The methods offering the best alternatives are regarded as the use of a muck heap, lagooning and disposal of the overflow to a blind ditch or by organic irrigation, and organic irrigation from polythene-lined holding tanks.

R.W.S.

Progress in Nutrition and Allied Sciences. Edited by D. P. CUTHBERTSON. Oliver and Boyd. 50*s*.

Published to commemorate the 50 years existence of the Rowett Research Institute, this book contains a series of essays by past and present members.

It will be appreciated, therefore, that the contents cover an immense area of knowledge. Each chapter traces the progress of a subject that has been a major study, and the coherent unfolding picture that is presented is always interesting and at times fascinating.

The philosophical hindsight that some of the more experienced contributors bring to their task is particularly valuable and suggests that such surveys, done at intervals of much less than 50 years, would probably benefit most research departments.

Most of the work done at the Institute between the wars, under the Directorship of Dr. (later Sir John) Boyd Orr, concerned human nutrition. As Lord Woolton recalls in the Foreword, it was the results of diet surveys made by workers at the Rowett in and around Aberdeen which gave him the information he required for the wartime measures that so improved our national diet. The early struggles to start and run the Rowett Research Institute are frankly described by Lord Boyd Orr; his account is continued and brought up to date by the present Director, Dr. D. P. Cuthbertson, who, as well as contributing several chapters, also edited the volume.

The expansion of the Rowett to its present size has come about mainly since 1945, when the emphasis shifted from human to animal nutrition. Much of the work summarized here concerns the many varied aspects of ruminant nutrition, although the horse, pigs and poultry have their own chapters.

Particularly in the fields of ruminant physiology, biochemistry and microbiology, one is left with a strong sense of the major part that research at the Institute has played in helping to elucidate the complex problems involved in producing milk, meat and wool.

The authors are specialists, but the scope of the work of the Rowett over these 50 years has been so wide that anyone concerned with the application of science to nutrition—particularly research workers, advisory officers or students—will find much that is of immediate interest; and the essay style of many of the chapters should lure the reader on to accounts of work in fields outside his normal ken.

It was a happy thought to commemorate the jubilee in such a permanent, lucid and useful manner, and Dr. Cuthbertson and his colleagues are much to be congratulated on this excellent, well-printed, well-produced volume.

R.W.

Grass Tetany. ANDRÉ VOISIN (translated by C. T. M. HERRIOTT). Crosby Lockwood. 55*s*.

In the last four years Dr. Voisin's books have provoked a wide circle of readers to a keener and more critical interest in grassland management. He now gives us a comprehensive review of research, experience, and ideas relating to grass tetany, losses from which have generally acquired prominence with newer grassland farming methods giving higher levels of grassland productivity and involving heavier use of fertilizers. Altogether he draws upon nearly 400 references for his material, so that the bibliography alone is a monumental and a valuable contribution to the literature on this complex problem, but he specifically restricts his main discussion to that form of tetany which is accompanied by a low magnesium content in the blood serum. This hypomagnesaemic tetany he regards as 'an excellent example of metabolic disease caused by the imbalance created in the soil by the methods of cultivation applied'.

The cause of the disease has not yet been defined, but the author is satisfied that methods of prevention derived empirically from practical experience have so often proved successful that they merit scientific explanation.

This is the main aim of Dr. Voisin's book. The emphasis throughout is on preventive medicine, not on the clinical or therapeutic aspects, and the discussion is so sectionalized in its presentation as to meet the differing needs of farmers, veterinary practitioners, advisers, and specialists. More technical chapters carry short summaries for the non-specialist.

The book as a whole is not easy reading, but it gives a great wealth of information on grass tetany, from which Dr. Voisin succinctly recommends methods of therapeutic treatment and rules for carrying out preventive measures on affected farms.

Printing and format are of high standards; author, translator, and publishers are to be congratulated on this work, which should appeal strongly to all interested in, or curious about, this exasperating affliction to which grazing ruminants can be subject.

J.E.N.

A Forestry Venture. W. E. HILEY. Faber and Faber. 42*s*.

The present remarkable growth of tree planting on privately-owned estates and farms—35,000 acres were planted among 3,000 estates in 1962—shows that many people are finding woodlands a profitable investment. Yet few figures have been published that enable anyone to form an overall picture for any estate as a whole, over a long span of years.

This noteworthy book does just that for a representative property with 2,000 acres of woodlands at Dartington Hall in South Devon, over thirty years from 1932 to 1962. Its main author died before it could be completed, but his account has been ably rounded off by Leonard Elmhirst, who was his collaborator in the forestry enterprise throughout.

After a university career as a mathematician, botanist, and forest economist, Wilfred Hiley left Oxford for Dartington in 1932, keen to put his ideas into practice in a concern that—however well it might be financed initially—was obliged to pay its way.

He took charge of 200 acres of woods with an old sawmill, the whole being too small to form an economic unit of management. Courageously, he persuaded the estate to acquire, by stages, a further 1,800 acres, and to extend its operations over two modern sawmills, forest nurseries, growing Christmas trees, and contracting for other landowners. He did not hesitate to tackle run-down old oak coppices on steep Dartmoor hillsides, devoid of any sort of road; by careful timing, he converted them to plantations of larch, Douglas fir and spruce, growing rapidly to meet modern timber needs.

The war helped, but on the other hand the depression of the 1930s, and changing markets in recent years, hindered progress. Though he had little mature timber to sell, Hiley continually maintained income, controlled costs and produced masterly accounts that proved forestry will pay, whether it be considered as a long-term investment or on an annual profit-and-loss basis.

In one respect he has been too modest. Anyone who has wandered through the woods he loved—and foresters came from every part of Britain and many foreign lands to see his work—will long remember their charm. He kept his trees healthy by heavy thinnings that were thought wasteful at first but are now widely adopted. There was always a rich dividend of landscape beauty, as well as a percentage profit in the balance sheet.

Hiley has set down all that he did, and why he did it, in good, simple English; there is no silvicultural jargon here. He describes the woods as he found them, the trees he planted, the markets for poles and sawtimber, the routine of office organization and accounts, so clearly that any keen owner, in like circumstances, can see just how to set about the job. This book is an excellent investment for anyone who owns woods or manages them; it is also a readable record of a successful experiment in rural restoration.

H.L.E.

Beekeeping Techniques. ALEXANDER DEANS. Oliver and Boyd. 25*s*.

The title of this book is rather misleading in relation to its contents. Five of the fourteen chapters, occupying 65 of the 157 pages, are concerned with techniques—microscopy and the use of the microtome, methods of honey analysis, the statistical evaluation of experimental data—applicable in a laboratory or at the study desk rather than to the actual keeping of bees or the harvesting of honey. Nevertheless, in these chapters there is assembled a mass of information that the practising beekeeper with an interest in such matters is unlikely to come across elsewhere in his technical reading. To what extent it will be of direct use to him will largely depend upon the range of non-beekeeping equipment and chemical reagents he is prepared to acquire, along with the skills needed to use them.

The more strictly beekeeping techniques listed in the table of contents concern bee breeding, the rearing, introduction and appraisal of queens, a method of swarm control, honey production, heather honey and its particular problems, the judging of honey on the show bench, bee disease control and diagnosis. In the text these subjects are dealt with in detail, the practical instructions being interspersed with background considerations of a more theoretical nature.

In the chapter on diseases, it is surprising to find that mepacrine hydrochloride is recommended for the treatment of Nosema disease (it has been shown experimentally to have no curative properties) and that there is no mention of the role played by residual contamination of combs in the natural history of the causative parasite. Surprising, too, is the statement on page 78 that the cause of European Foul Brood disease 'is not definitely known in spite of many scientific efforts to establish a particular bacterium as the causative agent',

especially when on page 88 it is given, correctly in the light of modern research, as *Streptococcus pluton*. And few, nowadays, would accept the author's view that the remedy for this disorder is simply the re-queening of the colony with a queen of an entirely different strain.

P.S.M.

General Microbiology. R. Y. STANIER, M. DOUDOROFF and E. A. ADELBERG. Macmillan. 50*s*.

The first edition of *General Microbiology* contained an appendix—The Biological Background—the intention of which was to acquaint microbiology students with the concepts of general biology, and thus to enable them to appreciate the relationship of their particular subject to biology as a whole.

As the authors point out in the preface to the second edition, this innovation was very favourably received by many users of the book. The material originally included in the appendix has therefore been introduced at appropriate points in the body of the text, so that a more coherent and logical development of certain topics has been possible. In my opinion it is essential that students of microbiology be familiar with the inter-relationship of the many aspects of biology, and the authors are to be congratulated on the lucid and interesting way they have developed this theme. It is no real disadvantage that certain chapters in the book now contain little material specifically concerned with micro-organisms.

Such a vast amount of information on the many aspects of microbiology has been published in recent years that some degree of weakness in certain chapters is both understandable and inevitable: this criticism applies particularly to some of the chapters dealing with applied microbiology (which admittedly is largely outside the scope of the book). The reading list provided at the end of each chapter should help to make good this slight deficiency. The greater part of the book, however, will provide the student with a more than adequate amount of information, clearly and concisely written.

In general the drawings and photographs are of excellent quality, but in some instances, when parts of a photomicrograph are to be identified, it is very difficult to find the letters used: surely small black identifying marks and letters should not be used when the background is also very dark.

The content and price of this book make it thoroughly worthy of recommendation to all students of microbiology.

D.J.J.-W.

Farm Crops: Books One and Two. S. H. BULLIVANT. Longmans Green. 6*s*. 6*d*. *each*.

The subject of Rural Studies is fairly widespread today in many modern schools in country areas. In these schools an interest in farming matters is to be expected. In some urban schools also—particularly those joining in 'Farm Adoption' schemes—a similar interest in farm affairs is to be found.

There is obviously a need for text-books for these classes, and the series of which these two books form a part is clearly designed with this purpose in view.

Rural Studies is a very wide subject—in fact it embraces and calls upon a good many other branches of the school curriculum; when taught with imagination it can form a very vital interest and will direct children's energies into a worthwhile activity.

These two books illustrate several of the essentials of the rural studies approach; they also draw attention to some of its weaknesses. Mr. Bullivant has crammed into both books a vast amount of material. While much of it is relevant, there is also a good deal which it is difficult to justify.

If the books are aimed at school children, as one might expect, an appreciable proportion of the text is just too much for an average modern school child. There is a profusion of material throughout, and, in the absence of clear and imaginative layout, the overall effect is confusing. At times, I suspect that the material has run away with the author, and the suggestions for further reading include literature which might tax the time and resources of far older readers.

The illustrations are well prepared; many of them suit their purpose, being extremely clear and instructive. Examples of this include the types of sugar beet seed, and a few of the machinery pictures. However, many of these illustrations are either unnecessary or fail to make a useful point—as with the conventional historical scenes, the root-gapper, and the hammer-mill. The chart showing water content of farm crops shows so little contrast that it makes a negative impact, and the jolly picture of an Anglo-Saxon beer-party fails to make much point about the barley crop.

There is much useful material in these books for the keen rural studies teacher, but one would ask for and expect a considerable degree of pruning and a more judicious selection in any more books planned in this series.

G.S.B.

The Lily Year Book, 1964. Royal Horticultural Society. 15*s*.

Although one of the most ancient of cultivated flowers, lilies have long remained a specialist's plant, arousing admiration rather than affection. Species have come from all over the world; this volume includes an account of Collinson's eighteenth century, as well as recent, introductions. There was little hybridization until the present century was well advanced. Recently, extensive and fruitful work, particularly by de Graaff in Oregon, has changed the picture. The spectacular results have focussed attention on hybrids, which, logically, claim the lion's share of space in the present volume.

There are excellent articles on the principles and practice of lily breeding by two New Zealand exponents, while the two leading English hybridizers, O. E. P. Wyatt and G. W. Darby, give accounts of their experience. Hybrids are here to stay, and they have a great future.

Details of the culture and contents of the lily collection at Kew Gardens, and descriptions of lily growing in alkaline soils in the Cotswolds and East Anglia, all emphasize the widening horizons. The cultural care which lilies require is rightly stressed, for they are not likely ever to become 'easy' plants. However, the reader may well become infected with an urge to grow them.

The Lily Group of the R.H.S. really functions as a group, and several of their corporate activities—discussions, expeditions and a group exhibit—make interesting reading.

The show bench does not play such a large part in this *Year Book* as in some others, but the tentative classification of lilies and lily-hybrids will be valuable to exhibitors, besides being a useful guide for those bewildered in the ever-growing forest of hybrids.

Some related plants also find a place in this volume; one article presents the now popular Hosta (Funkia) as an excellent foliage plant and companion for lilies. Fritillaries, long neglected, are given well-deserved attention, stimulated by recent collecting forays in Asia Minor.

The *Year Book* is generously illustrated, and the colour plates are of exceptionally good quality.

K.H.J.

Shooting Pigeons. C. L. Coles. Percival Marshall. 10*s*. 6*d*.

There are no short cuts to success in shooting pigeons and no substitute for field experience. This is Charles Coles' main conclusion and, as the Manager of the Eley Game Advisory Station at Fordingbridge and an active shooting man for thirty years or more, he is in a position to know. This book is accurate and well-informed, on both the sporting and biological aspects of wood-pigeons. Full note is taken of the biological research carried out during the past ten years and it is understood that the damage suffered by farmers is largely a domestic issue, rather than a problem that could be blamed on 'foreign' birds immigrating from the Continent.

There are many tips and wrinkles, on subjects ranging from camouflage to cooking, and excellent advice on equipment of all kinds, on shooting when seated and the speedy construction of adequate hides. Although flight-shooting is not neglected, there is more emphasis—as might be expected from a friend of Major Archie Coats—on decoy shooting and the importance of field-craft, rather than lifelike models. I like the story of the decoyer who rolled a wet bottle in grey wood ash and shot a pigeon that was attracted by it.

Mr. Coles deplores the inefficiency of organized county shoots, with their very low ratio of kills to cartridges fired. Using a good sporting metaphor, he describes the present control measures as 'largely un-co-ordinated pin pricks' and strongly advocates the encouragement of decoy shooting. He emphasizes the need for observation, and local knowledge of crop disposition, before siting decoys and the advantages of locally organized crop protection units of competent wood-pigeon shooters.

The author's style is smooth, his touch light and his quizzical, personal approach to the outdoor life will please many readers.

H.V.T.

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